

Development of Basic Data & Knowledge Regarding
Organic Removal Capabilities of Commercially
Available Home Water Treatment Units Utilizing
Activated Carbon: Phase 3 Addendum

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DEVELOPMENT OF BASIC DATA AND KNOWLEDGE REGARDING ORGANIC REMOVAL
CAPABILITIES OF COMMERCIALY AVAILABLE HOME WATER TREATMENT UNITS
UTILIZING ACTIVATED CARBON

Phase 3 Addendum - Surface Water Supply: Problems And Evaluation

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Frank Bell, Project Officer: The Phase 3 Addendum contains results of the surface water and other unit studies and related technical problems.

16. ABSTRACT

An extensive study of commercially available home water treatment units has been conducted over a 3-year period to examine organics reduction and microbiological factors.

The Phase 3/Final report provides a summary of Phase 1 and 2 results as well as detailed reporting of Phase 3. Phase 3 included the testing of 10 selected activated carbon units against a ground water spiked with carbon tetrachloride, trichloroethylene, tetrachloroethylene and 1,1,1-trichloroethane and of the same units against a surface water spiked with the above and with p-dichlorobenzene, hexachlorobenzene and chlordane; field studies (Miami, Fla.; Pico Rivera, Calif.; Atlanta, Ga.; and Detroit, Mi.) on four units; home tests on three units; bacterial leaching studies; spent carbon study; studies of limited value on four other units (reverse osmosis, ozonator, ultraviolet). Test data on two distillers had to be discarded because of technical problems.

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PREFACE

The following addendum report has been written to detail the results and conclusions of laboratory tests on point-of-use drinking water treatment devices challenged with spiked New Orleans tap water. This report accompanies the Phase 3/Final Report on "Development of Basic Data and Knowledge Regarding Organic Removal Capabilities of Commercially Available Home Water Treatment Units Utilizing Activated Carbon." The data from Phase 3 studies on spiked surface water included in this report was assembled and reported separately from the main Final Report because the data may be adversely biased due to procedures used to prepare the spike challenge water. It was felt that reporting the data in this manner would help keep the results in their proper perspective and prevent them from being compared directly to earlier results where the potential biasing was not present.

This potential biasing occurs due to the presence of methyl alcohol in relatively substantial quantities in the challenge water. The methanol was added to the challenge water to increase the solubility and thereby the aqueous concentration levels of the more difficult to dissolve hexachlorobenzene and chlorodane spike compounds. As a result of the methanol or other complicating factors most organic reductions were lower, bacterial plate counts levels were higher, and the definite possibility of constant boiling azeotropic mixtures was present.

The addendum report includes data and results for the spiked surface water study on the same ten activated carbon models used in the Phase 3 groundwater study as well as several units whose primary functioning does not depend on activated carbon filtration (e.g., reverse osmosis devices, ultraviolet devices, and ozonization). For the reasons mentioned above data all bacterial data were omitted as well as all data from the distiller studies. The organic removal data is presented and summarized because it was felt these results were positive, meaningful, and should be available to interested parties.

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SECTION 1

INTRODUCTION

This report details experimental test results from laboratory tests on ten activated carbon, two reverse osmosis, an ultraviolet, and an ozonization type point-of-use treatment devices. The units were challenged with spiked New Orleans tap water. The results of organic chemical reductions are presented and discussed.

The organic chemical reduction data is present in this addendum format because the study was performed using a large concentration of methanol as a carrier solvent in the challenge water and the results may be biased due to this practice. Discussion on the potential impact of the methanol is offered in both Sections 2 and 4.

Bacterial and bacterial-related data from these tests have been omitted due to erratic and unusual values which may possibly be associated with the use of carrier solvents. All organic data from the distiller unit test was omitted due to the possible erroneous results caused by the formation of constant boiling point azeotropes between the methanol and model compound solutes.

SECTION 2

SUMMARY OF RESULTS AND CONCLUSIONS

The summary of results and conclusions have been separated into two sections; the first section summarizes the results from the study of the activated carbon filters and the second part discusses the results of test on the non-carbon treatment units (reverse osmosis, ultraviolet, and ozonization units). Both sets of data are potentially affected by the presence of the methanol which was used in preparing the spiked challenge water. Some of the adverse effects are discussed below. The organic data generated in this study are presented and summarized in this report but all bacterial related data have been deleted due to their suspect nature and the confounding effects of the methanol. It was felt the organic removal data provided useful information regarding the removal capabilities under very severe conditions. The test as conducted do not represent any "real life" drinking water test. All the data from the distiller units were deleted due to the potential erroneous results caused by the formation of methanol/halogenated organic contaminant azeotropes.

Methanol (approximately 170 ppm in the challenge water) and to a lesser extent hexane (approximately 1 ppm in the challenge water) were used to assist in the preparation of the halogenated organic spike challenge water. The use of these two substances create several potential adverse effects on the point-of-use treatment devices challenged with spiked surface water.

1. Activated carbon adsorption is a competitive process, and the methanol and hexane can compete for active adsorption sites in the units. This competition probably accounts for the observed decrease in THM removal efficiencies for some of the carbon filters in the spiked surface water study.
2. The organic contaminant removal performance of the distillers can be adversely affected due to the formation of multi-component azeotropes which can result in contaminants being carried over into condensate waters.
3. Cellulose acetate membranes, like those used in the reverse osmosis units, can be affected by alcohols. It is not known whether the membranes in the reverse osmosis units studied were affected by the methanol at the relatively low concentration present in the challenge water (<0.001%) although the possibility exists.

The organic removal data is presented and discussed despite the confounding carrier solvent issue because the treatment devices demonstrated significant tolerance to the methanol/hexane levels and exhibited appreciable reductions of spiked halogenated organics.

ACTIVATED CARBON UNIT STUDIES

The halogenated organic (HO) removal data indicate the selected models (at least one model from each of four basic configurations) were effective in removing the spiked level of HO from New Orleans tap water (49-99 average percent removal). The summary data of HO removal indicate that line-bypass units, generally, are more effective in removing HO from spiked New Orleans tap water than are stationary, faucet-mount, or pour-through units. Line-bypass units removed from 65 to 99 percent HO; whereas, the stationary unit removed 49 percent; faucet-mount units, 50 and 60 percent; and the pour-through unit, 66 percent.

Examination of the percent THM reduction levels experienced in the spiked surface water test reveal generally lower levels than measured in earlier laboratory test on identical models. The depressed levels of THM reduction ranged from 0 to 40 percent lower for the various models tested. One would not expect different treatment models, utilizing different type carbons, to respond in the same manner and to the same extent to the presence of methanol in the challenge water. The observation of this effect further supports the characteristic selective nature of activated carbon adsorbents. It is assuring to observe significant reductions of HO and THM contaminants (49-99 and 24-99, respectively) despite the adverse conditions of the test water challenge.

Nonpurgeable total organic carbon (NPTOC) levels were not monitored throughout the spiked surface water study since they would only represent the removal of methanol. It is known that activated carbons do not have a strong affinity to alcohols. Reporting data on NPTOC removal would be misleading.

Total organic halide (TOX) is defined by the sum of purgeable organic halide (POX) and nonpurgeable carbon adsorbable organic halide (NPCOAX), ($TOX = POX + NPCOAX$). Both POX and NPCOAX levels reported in the surface water study are comprised of varying amounts of the four THM, the seven spiked compounds, and unknown organic halides. NPCOAX influent levels of spiked New Orleans tap water ranged between 98 and 202 ppb, (average 154 ± 46 ppb), and NPCOAX effluent sample levels from respective units ranged between 4 and 190 ppb. Generally, the calculation of percent NPCOAX reduction involves the comparison of influent and effluent samples collected on or near the same day; however, only five influent NPCOAX samples were analyzed (contract limitations) during the 75 day testing period. Since the limited number of influent samples did not permit the day to day description of challenge water, many of the data sets of NPCOAX reduction were determined using estimated or average NPCOAX influent levels. The uncertainty produced by estimated influent levels was reflected, in part, by the scattered pattern of NPCOAX data sets for most of the respective units (e.g., some data sets indicated NPCOAX addition). Generally data sets of NPCOAX reduction for respective units appeared 20 to 30 percent below the corresponding levels obtained from the HO data.

NON-CARBON UNIT STUDIES

Three alternate type point-of-use treatment technologies were screened for their performance on spiked halogenated organic compounds in water. All three treatment technologies (reverse osmosis, ozonization, and ultraviolet) utilized activated carbon filtration at one point or another in their overall treatment process. Data is reported on the reductions of THMs and HOs achieved by these treatment devices.

Reverse Osmosis Units

The halogenated organic removal data for the reverse osmosis models provided some interesting insight into the functioning of the units. The Aqua Cleer (THM) model demonstrated THM reductions between 92 and 99 percent and 99 percent reduction for the other HO compounds (1,1,1-trichloroethane; carbon tetrachloride; trichloroethylene; tetrachloroethylene; p-dichlorobenzene; hexachlorobenzene; and chlordane). The WPSI-UTC-5 model demonstrated a significantly different pattern. The WPSI-UTC-5 removed between 0 and 52 percent of the THM while demonstrating between 50-99 percent removal of the other HO compounds. This difference is probably due to the carbon application design difference between the two models. The incorporation of additional carbon filtration at a very crucial point in the treatment scheme of the Aqua Cleer (THM) unit appears to make a significant difference in the units performance in removing organic contaminants, especially the lower molecular weight more membrane permeable constituents (e.g., chloroform). The removal of NPCAOX, which represents the higher molecular weight HO, demonstrated a much smaller difference between the two reverse osmosis models. Both models exhibited greater than 80 percent reduction of NPCAOX. NPCAOX compound removal, due to molecular size, might be expected to be removed more efficiently by the membrane. The primary functional difference between the two models appears to involve a more efficient removal of the lower molecular weight fraction of the challenge compounds.

Ozonization Unit

The Ozomatic Water Purifier reduced HO by approximately 70 percent. The HO reduction curve indicated fairly consistent reduction over the time and the volume of water processed. The HO data sets ranged from 58 to 78 percent. The NPCAOX data sets exhibited consistently lower reduction (<40 percent) and data sets ranged from 4 to 36 percent. The HO and NPCAOX results presented a confusing picture: the specific HO GC/ECD analysis indicated appreciable reduction of the nonvolatile HO (NPCAOX are also considered to be nonvolatile HO) while the nonspecific NPCAOX analysis indicated minimal NPCAOX reduction. A plausible explanation for this ambiguity is that the spiked HO were chemically altered by the ozonation process and therefore were not detected by the GC/ECD as the respective spiked compound, whereas chemical breakdown of HO may not affect total NPCAOX levels (nonspecific measurement).

Ultraviolet Water Conditioning Unit

The Ultraviolet Water Conditioner, Model CW-5 reduced HO in a pattern similar to a typical activated-carbon adsorption curves. This observation may indicate that the carbon filter in the unit was the major functioning design feature in HO reduction. Data sets for HO reduction ranged from 21 to 98 percent. The average NPCAOX reduction was less than 10 percent with data sets ranging from 0 to 4 percent. The low HO and NPCAOX reduction results were probably due to the design of the system, which allowed very little time for the sample in the UV exposure chamber as well as short contact time with the carbon filter. As with ozonization, there appeared to be chemical modification of the spiked HO, particularly isomer ratio shifts of chlordane. Examination of the GC/ECD chromatograms indicated changes in specific isomer ratios of chlordane. This occurrence may have resulted in effluent chlordane levels to be reported at values lower than those actually present. This phenomenon was not investigated further and did not significantly affect the reported HO reduction results.

SECTION 3

EXPERIMENTAL PROCEDURES

TEST PROTOCOLS

Overview of Phase 3 Surface Water Study Experiments

Two different groups of point-of-use water treatment devices were examined in the spiked surface water studies. The first group consisted of the 10 models of activated carbon units evaluated in the Phase 3 groundwater study and reported in the Phase 3/Final Report. The second group included treatment devices with primary functioning based on processes other than activated carbon adsorption (e.g., reverse osmosis, ozonization, and ultraviolet irradiation). Although several of these treatment processes included activated carbon in addition to their primary function, they have been categorized into one group and labeled as non-carbon treatment units.

The treatment units were challenged with pH adjusted New Orleans water spiked with a variety of organic model compounds. Nonpurgeable total organic carbon (NPTOC), SPC, and endotoxin levels have not been reported due to anomalous behavior observed in the results which may be due to the large concentration of methanol required to solubilize the hexachlorobenzene and chlorodane. The organic data is presented since it demonstrates the efficiency of activated carbon and other processes despite the presence of overwhelming concentrations of methanol (~170 ppm).

The following sections detail the experimental procedures followed in completing this portion of the point-of-use treatment study.

PHYSICAL DESCRIPTION OF UNITS

The ten activated carbon units tested with the spiked surface water are listed in Table 1. Four noncarbon units were tested during Phase 3. Each noncarbon unit employed unique combinations of filtration techniques which are discussed below.

Aqua Cleer Model H-5 (THM)

The unit is manufactured by Culligan International Company, Northbrook, Illinois, and basically consists of sediment prefiltration (5 μ), reverse-osmosis membrane filtration, and carbon filtration. The basic model H-5 comes with one carbon filter (approximately 66 grams of carbon) which is normally placed between the storage reservoir and the dispensing faucet. In this configuration, the flow rate through the small carbon filter is in the

TABLE 1. PHYSICAL DESCRIPTION OF FAUCET-MOUNT, STATIONARY, POUR-THROUGH, AND LINE-BYPASS MODELS TESTED IN THE SURFACE WATER STUDY

Unit	Rated capacity (gallons/liters)	Approximate volume of carbon (cm ³)	Carbon weight (g)	Iodine number	Test flow rate (gpm/lpm)
<u>Faucet Mount</u>					
Hurley Town and Country	4000/15142	1765	895	913	0.8/2.9
Water Washer, Model 1000	1000/3785	310	70 ^a	845	0.5/1.7
<u>Stationary</u>					
Sears Taste and Odor	3000/11356	660	398	920	2.3/8.7
<u>Pour-through</u>					
Fillbrook Pour-through	500/1892	146	97	788	0.04/0.2
<u>Line bypass</u>					
Aquacell Bacteriostatic	2000/7571	663	417 ^a	867	0.9/3.2
Aqualux, Model CB-2	2000/7571	1760	1150 ^a	966	0.8/3.0
Continental, Model 350	720/2726	7079	3402	960	0.6/2.3
Culligan, Model SG-2	4000/15142	2470	1708	980	1.0/3.8
Everpure, Model QC4-THM	1000/3785	1650	765	1223 ^b /798 ^c	0.6/2.3
Seagull IV	1000/3785	739 ^d	300	434	0.8/3.0

^a impregnated with silver

^b from cartridge number 1 Everpure QC4-THM

^c from cartridge number 2 Everpure QC4-THM
(includes binder and powdered carbon)

^d block of carbon and binder

range of 0.5 to 1.0 gallons per minute. The modified system incorporates a second identical carbon filter prior to the accumulation reservoir for water filtered by reverse-osmosis to trickle through before storage in the reservoir.* The Model H-5 system was adapted to testing by incorporating a solenoid valve between the last carbon filter and the dispensing faucet. This modification allowed automatic on-off cycling of the unit between sampling periods.

Water Purification Systems, Inc. Model WPSI-UTC-5

The Model WPSI-UTC-5 is another example of a combination reverse-osmosis and activated-carbon treatment unit. The system is manufactured by Water Purification Systems, Inc. of Los Angeles, California. The unit is essentially the same as the Aqua Cleer except that there is only one carbon filter, which is located after the reservoir. The carbon element was a carbon impregnated felt cartridge (2.5" diameter x 4.9" length). The system also incorporates an automatic feature to allow the unit to flush the module periodically. As with the Aqua Cleer system, the WPSI-UTC-5 system was modified by inclusion of a solenoid valve immediately prior to the dispensing faucet to allow automatic cycling.

Ozomatic Water Purifier

The Ozomatic Water Purifier is another combination unit utilizing two technologies, ozonation and activated-carbon filtration. The purifier is manufactured by Ecology Sales Corporation of Florida in Jacksonville, Florida. The unit consists of an ozone generator sealed into a base assembly and an ozone contact reservoir. The contact reservoir is connected to the ozone generator via tubing terminating with an air stone. There is a small activated-carbon filter (175 grams of activated carbon) in the reservoir lid to prevent excess venting of ozone gas. An identical activated-carbon filter is located in the base of the reservoir so that the treated water flows through the filter before being dispensed through a spigot.

The Ozomatic Water Purifier is operated by hand filling the reservoir and starting a timed treatment cycle of about 15 min. During this time, approximately 1.5 gallons of water are treated.

Ultraviolet Water Conditioning System Model CW-5

The Model CW-5 utilizes both ultraviolet and activated carbon treatment processes and is manufactured by Clean Water Systems of America in Van Nuys, California. The unit is connected to the cold-water line where existing water line pressure drives the water through the activated-carbon filter (a standard 10" carbon impregnated felt cartridge), past a fail-safe solenoid valve, through the ultraviolet treatment chamber, and out the dispensing faucet. The purpose of the fail-safe valve is to prevent water from flowing through the system in the case of failure of the 36,000 $\mu\text{w-sec/cm}^2$ ultra-

*This carbon filter was added as a modification to the basic Model No. H-5 and was recommended for THM reduction.

violet (260 nm) irradiator. The circuit to the electrically operated faucet was tapped to automate the cycling of the system by automatic timer controls.

WATER-SPIKING-SYSTEM

An integral part of the surface water activated carbon and nonactivated-carbon unit study was the development and employment of a dependable water spiking system. The water spiking system was constructed so that two configurations could be employed (Figure 1). The first configuration contained elements A-L and was used in the groundwater study and reported in the Phase 3/Final Report. The spiking system and a testing manifold were conveniently housed in an 8 foot x 16 foot mobile trailer. The second configuration of the spiking system included the addition of a 500 gallon tank (element M) which contained the spiked concentrate of chlordane, hexachlorobenzene, and acid necessary to provide pH adjustments to the matrix water.

Figure 1 depicts both configurations of the water spiking system and the following is a description of how the overall spiking system worked. The matrix water (A) was drawn from the surface water source (New Orleans tap water). The water was prefiltered (B) to remove sediment and pumped (C) into an 80-gallon glass-lined tank (F). A concentrate (J and M) of the "spike" compounds was added (K) to the feed water by injection, and mixing was achieved by an in-line static mixer (E). The volume of water in the supply tank (F) was maintained at three fourths full by controlling the supply pump (C) and the metering pumps (K) with a level controller (L) in the supply tank. The pressure above the water in the supply tank (F) was maintained by compressed nitrogen (G). Operating the supply tank under pressure helps to minimize losses of volatile organics into head space areas. Another feature of the spiking system designed to produce a consistent "spike" was the manner in which the spike concentrate (J and M) was metered into the supply tank (F) via the static mixer (E). Initially, the supply pump (C) and the metering pumps (K) were activated when the level controller (L) indicated that the level of water in the supply tank was less than three fourths full. Next, to correct for variations in the start-up flow rates of each pump, the first volumes of water and concentrate (produced by 30 seconds of pump operation) were discarded. Only after 30 seconds of run time did the blend enter the supply tank.

Two different spike concentrates were employed. The first contained the solutes that were more water soluble. The second contained hexachlorobenzene and chlordane, which have low solubilities in water. Adequate concentrations in water were obtained for the more soluble constituents by direct dissolution into water. A consistent spike could not be obtained with the chlordane or hexachlorobenzene using this technique.

Schoor (1) in examining problems associated with low solubility of compounds in toxicity tests found that many organics, particularly pesticides, tended to form emulsions at low concentrations contributing to an unstable matrix. Reported solubility data in many cases appeared to be based

M. 500 gallon tank

Chlordane
Hexachloro-
benzene
pH

L. level controller

K. metering pumps

J. spiked concentrate

A. matrix water

10

D. backflow preventor
C. supply pump

B. sediment filters

E. static mixer

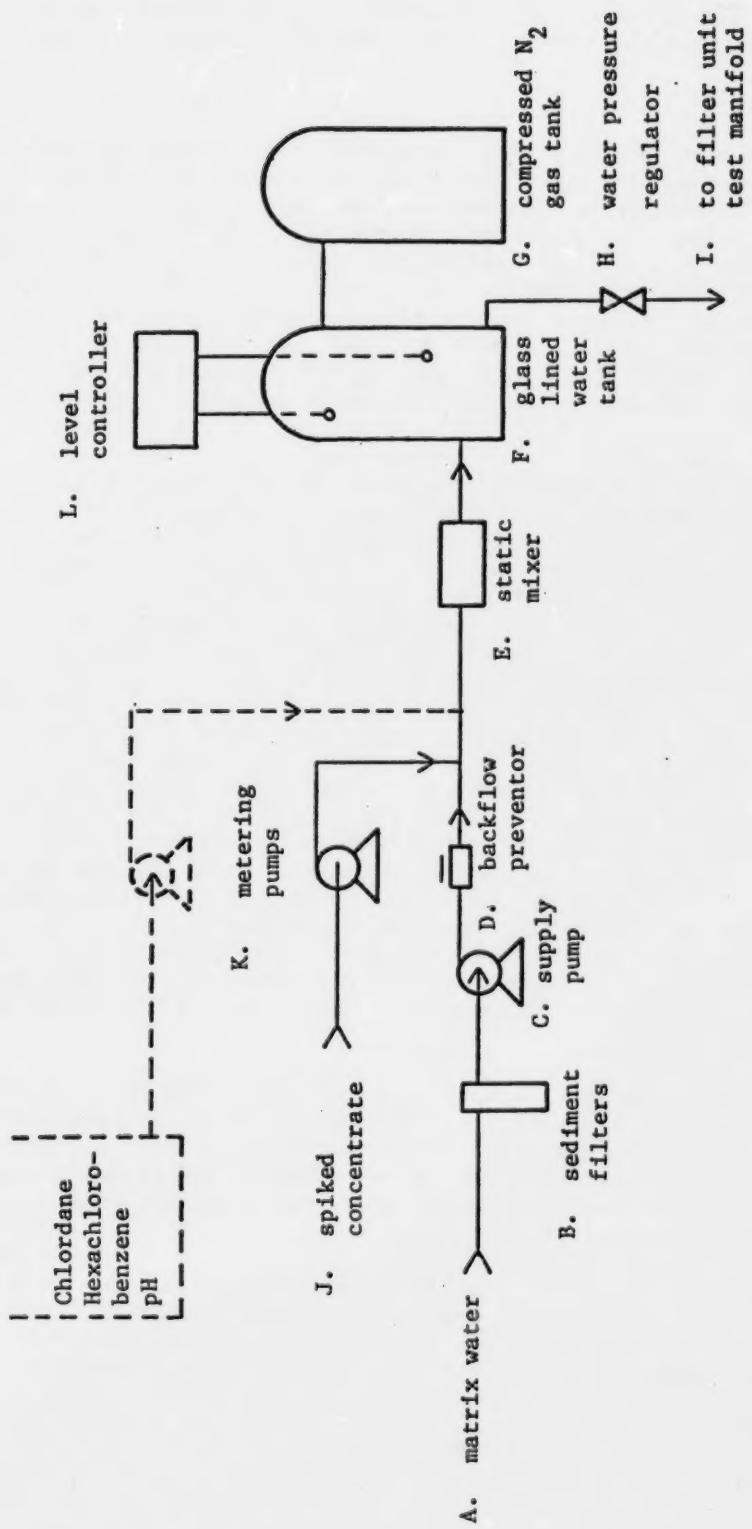
G. compressed N₂ gas tank

H. water pressure regulator

I. to filter unit test manifold

F. glass lined water tank

Figure 1. Water spiking system.



on emulsions rather than true solutions. Saturated solutions were achieved with slow agitation after extended exposure of as much as 30 days. Gunther (2) described a procedure for the preparation of consistent and stable organic pesticides by first dissolving the solute in a small volume of hexane and diluting the hexane into a larger volume of alcohol. The alcohol served as a carrier solvent into water. This procedure was employed in the spike concentrates in the surface water and noncarbon unit study of this program.

The spike concentrates with chlorodane and hexachlorobenzene were prepared in the following manner. The two solutes were initially dissolved in hexane. Approximately 12 milliliters of this hexane concentrate contained the necessary amount of spike solutes to yield target levels of chlorodane and hexachlorobenzene when diluted to challenge levels. The dosed hexane was then added to approximately 1900 milliliters of methanol which was then added to 500 gallons of pH adjusted water. This solution was stored in the tank (M-Figure 1). The spike solution was then blended at a ratio of 1:3.7 to prepare the challenge water for the test units. The result of these serial dilutions was to generate a challenge water with approximately 170 mg/l methanol, 1 mg/l hexane, near target levels of spiked organic compounds, and enough HCl to bring the pH to 7.

The various filter units in the surface water and nonactivated carbon unit studies were tested with water from the supply tank while on/off cycles of challenge water to individual units were regulated by a timer cam control system similar to what was used and reported in the laboratory tests of identical models during Phase 1 (5/10/79) and Phase 2 (6/30/80).

PERFORMANCE TESTING/SAMPLING SCHEDULE

Although the surface water study involved different type units and operating procedures, each test series contained many test protocols and performance parameters that were identical to those in Phase 1 and Phase 2 studies. A general description of the testing manifold, test procedures, and sampling schedule which were applicable in most of the studies was presented in the Phase 3/Final Report. Any deviation from these test protocols and performance parameters for the surface water study is explained in the appropriate subsection in the Results and Discussion section of this report.

METHOD OF ANALYSIS

Selected Chlorinated Hydrocarbon

Sampling--

Crimp-top serum bottles with Teflon-lined septa were used to collect the HO samples. Prior to sampling, the bottles were cleaned using the following procedure:

- Wash in a hot soap and water solution
- Rinse in tap water
- Rinse in Chromerge

- Rinse thoroughly in deionized water
- Rinse thoroughly in distilled water
- Rinse in methanol
- Drain dry
- Heat at 400°C for at least 1 hr
- Cool to room temperature
- Add 1 ml of 0.25 percent sodium sulfite per 100 ml sample
- Cap using Teflon-lined septum and crimp top, making sure the Teflon lining faces the sample.

When samples were collected, the crimp top was removed and the bottle filled to overflowing. Care was taken in resealing the sample bottle to avoid inclusion of air which could result in the loss of volatile organic compounds. The sodium sulfite solution added to each sample is generally accepted as adequate to quench the haloform reaction which results from the chlorination of drinking water. Samples were refrigerated at 4°C until analyzed.

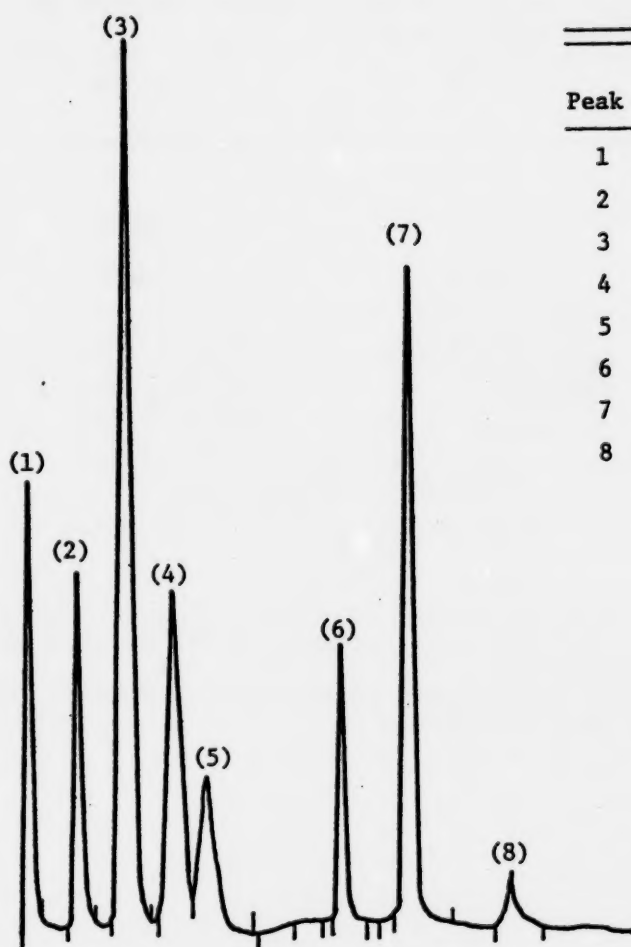
Analysis--

The analysis of water samples for spiked halogenated organics and trihalomethanes was performed using liquid-liquid extraction techniques followed by separation and quantification of the compounds of interest by gas chromatography (GC/ECD) with a ⁶³Ni electron-capture detector (2-4). Table 2 describes both sets of gas chromatographic conditions employed during Phase 3 work.

The surface water activated carbon and nonactivated-carbon unit studies included the analysis of 1,1,1-trichloroethane, carbon tetrachloride, trichloroethylene, tetrachloroethylene, p-dichlorobenzene, hexachlorobenzene, chlordan, and the four trihalomethanes: chloroform, dichlorobromomethane, bromodichloromethane, and bromoform. The analytical protocol required that GC analysis be divided between two procedures. The analysis of 1,1,1-trichloroethane, carbon tetrachloride, trichloroethylene, tetrachloroethylene, and the four trihalomethanes was performed in one set of analysis. A 5-ml aliquot of influent or 10-ml aliquot of effluent sample was extracted by shaking with 1 ml of purified methylcyclohexane (MCH). The layers were allowed to separate, and a 3-μl portion of the organic layer was injected into the GC. Chromatographic conditions and a typical GC trace for this analysis are listed in Table 2, Method 1 and shown in Figure 2. Qualitative identification was based on matching the retention times of peaks in the sample chromatogram with those in the chromatogram of a standard mixture containing the compounds of interest. Confirmation of compound identity (no interfering compounds were observed in the surface water samples) was possible by reanalyzing any sample in question under different conditions of liquid phase, solid support, temperature, and flow rate. The quantification technique employed was external-standard method, and all calculations were based on integrated peak areas, peak heights, or both.

TABLE 2. EXPERIMENTAL CONDITIONS FOR SPIKED HALOGENATED ORGANICS AND TRIHALOMETHANE ANALYSIS

Parameter	Method 1	Method 2
Column	A	B
Injection temperature	150°C	250°C
Oven temperature	47°C	90°C
Temperature program	47°C (10 min) to 67°C at 20°C/min (30 min)	90°C (4 min) to 170°C at 20°C/min (20 min) then to 235°C (30 min)
EC Detector temperature	300°C	300°C
Flow rate	20 ml/min	20 ml/min
Injection volume	3 µl	3 µl
Column A: 6 feet x 1/8 inch I.D. glass column packed with 10% Squalane on 80/100 mesh AW Chromosorb W.		
Column B: 6 feet x 1/8 inch I.D. glass column packed with 1.5% SP2550/1.95% SP 2401 on 100/120 mesh Supelcoport.		



LEGEND		
Peak	Compound	Concentration (ppb)
1	Chloroform	83.0
2	1,1,1-Trichloroethane	29.0
3	Carbon Tetrachloride	33.1
4	Bromodichloromethane	22.2
5	Trichloroethylene	37.5
6	Dibromochloromethane	13.7
7	Tetrachloroethylene	41.5
8	Bromoform	16.2

Gas chromatographic conditions, Method 2: 6 ft x 1/8 inch I.D. glass column packed with 10% Squalane on 80/100 mesh AW chromasorb W; carrier gas 5% methane, 95% argon; flow rate 20 ml/min; injector temperature 150°C; column temperature program 47°C (held 10 min) to 67°C at 20°C/min; Ni⁶³ electron capture detector temperature 300°C.

Figure 2. Representative chromatogram of a spiked halogenated organics and trihalomethane check standard.

The analysis of p-dichlorobenzene, hexachlorobenzene, and chlordane required different extraction and chromatographic conditions. A 20-ml aliquot of influent sample was extracted with 1 ml of MCH; the organic and aqueous layers were allowed to separate and a 3- μ l portion of the organic layer was injected into the GC using the conditions listed in Table 2, Method 2. A typical GC/ECD chromatogram is shown in Figure 3. Since effluent samples were anticipated to contain lower amounts of the halobenzenes and chlorodane, a 30-ml aliquot of effluent sample was extracted with 10 ml of pentane; the layers were separated and the organic layer was concentrated with a Kuderna-Danish (K-D) evaporator to 1 ml. A 3- μ l portion of the organic layer was injected into the GC using the conditions listed in Table 2, Method 2. The quantification technique employed for the latter three compounds was the external-standard method, and all calculations were based on integrated peak areas and/or peak heights.

Total Organic Halide Analyses (TOX)*

Sampling--

Cleaning and sampling techniques used in collecting samples for TOX analyses were similar to those used in the preceding analytical procedures. However, instead of crimp-top vials, 500-ml bottles fitted with Teflon-lined screw caps were used. The samples were collected and stored at approximately 5°C until analyzed. Analyses were completed with 60 days of sample collection.

Analysis--

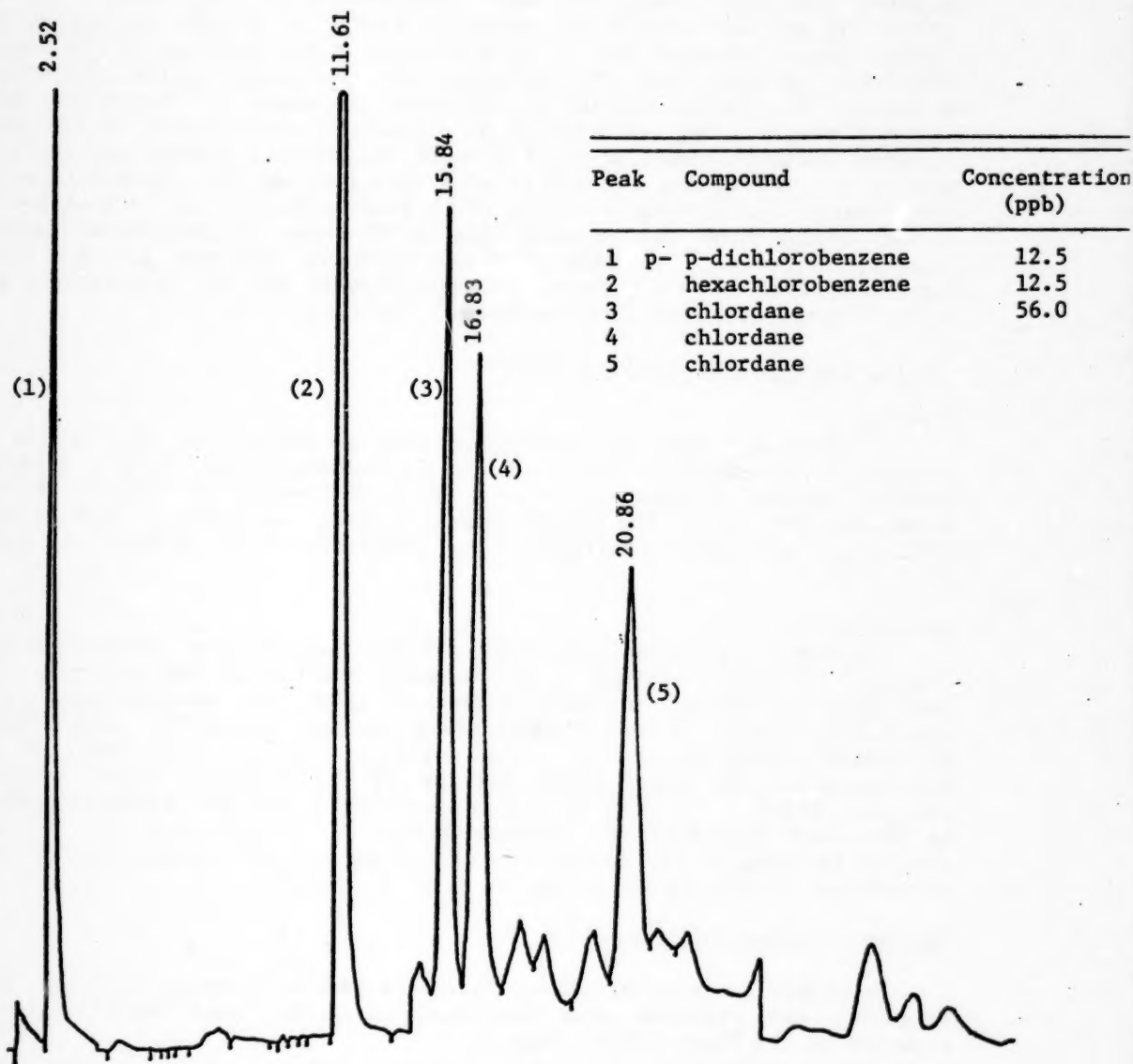
The total organic halogen (TOX or TOHa) analyses were performed using a Dohrmann instrument similar to the Dohrmann Model DX-20 TOX analyzer. This instrument analyzed for both purgeable (POX) and nonpurgeable carbon adsorbable organic halide (NPCAOX) which together equal TOX. The Dohrmann TOX method consisted of two steps. First, organics were adsorbed onto granular activated carbon (GAC), and the GAC was washed to remove traces of inorganic halides. Second, the GAC was pyrolyzed, and the resulting hydrogen halides were determined by microcoulometry.** To calculate the TOX of a sample, the sum of the halides derived from two GAC columns (connected in series) was divided by the volume of water processed.

Inorganic Analyses (Silver)

Inorganic analysis of silver, arsenic, barium, cadmium, chromium, lead, selenian, and chlorine were completed using the same methodologies as reported in the Phase 3/Final Report.

*All TOX analyses were performed by the University of Missouri, Columbia, Missouri.

**Manufacturer's instruction manual, Dohrmann Envirotech, 3240 Scott Boulevard, Santa Clara, California 95050.



Gas chromatographic conditions, method 3: 6 ft x 1/8 inch I.D. glass column packed with 1.5% SP2250/1.95% SP2401 on 100/120 mesh Supelcoport; carrier gas 5% methane, 95% argon; flow rate 20 ml/min; injector temperature 250°C; column temperature 90°C (held 4 min) to 170°C at 20°C/min (held 20 min) then to 235°C (held 30 min); Ni^{63} electron capture detector temperature 300°C.

Figure 3. Representative chromatogram of a p-dichlorobenzene, hexachlorobenzene, and chlordane check standard.

QUALITY ASSURANCE/QUALITY CONTROL PROTOCOLS

Spiked Halogenated Organics and THM Analysis

A rigorous quality-control program was followed in conjunction with these analyses. Before Phase 1 of this program, a nine-point calibration curve was constructed for each THM compound to establish detection limits and linearity ranges. Performance samples of THM were supplied to GSRI by the Environmental Monitoring and Support Laboratory of EPA for verification of the analytical procedure. A satisfactory rating was received. During Phase 3, GSRI established seven-point calibration curves, detection limits, and linearity ranges for the additional spiked halogenated organics: 1,1,1-trichloroethane, carbon tetrachloride, trichloroethylene, tetrachloroethylene, P-dichlorobenzene, hexachlorobenzene, and chlordane. Performance samples of the spiked compounds (except P-dichlorobenzene and hexachlorobenzene) were again supplied to GSRI by EPA. A satisfactory rating was received. The following quality-control samples were run each time the samples were analyzed during Phase 3:

- solvent blank: aliquot of solvent which was used to extract that day's samples.
- method blank: extract of water which was used to prepare standard.
- low standard: standard in which the concentration of each compound was higher than at the midpoint of the calibration curve.
- check standard: standard in which the concentration of each compound was approximately the concentration expected in the samples.
- duplicates: extracts from two samples collected sequentially from the same sampling point.
- spikes: extracts from two samples collected sequentially from the same sampling point. One of these samples was fortified with a mixture of the compounds of interest at known concentrations.

Analysis of solvent and method blanks provided a check on the purity of the materials used in the procedure. If any amount of the five halomethane compounds was detected in these samples, that material, either solvent or water, was purified again and reanalyzed before it was used. Analysis of the low, high, and check standards monitored the performance of the GC on a day-to-day basis. If values obtained from analysis of these quality-control samples ranged outside the limits of precision, the nine-point calibration curve was reconstructed and a thorough check of the instrument parameters, column conditions, and detector response was made.

The precision of the procedure was established by the analysis of duplicates. Precision was quantified according to the equation

$$R_c = 3.27C \frac{\sum R_i}{\sum X_i} \quad (1)$$

where

R_c = critical difference

X_i = average value obtained for duplicate analyses

R_i = difference between the values obtained for duplicate analyses.

Qualitatively, the smaller the R_c value, the better the precision of the analysis. Quality-control charts were generated from these data and updated each day the analyses were performed.

Accuracy of the analyses was monitored by comparing the value obtained for the check standard (O_i) with the true value (T_i).

$$P_i = 100(O_i - X_i)/T_i \quad (2)$$

where

P_i = percent recovery (accuracy)

O_i = observed value

T_i = true value

X_i = dilution factor (if significant)

The recovery efficiency of the analysis was determined by analyzing spiked samples and comparing the difference in the values obtained for the spiked and unspiked samples with the level at which the sample was spiked (essentially equation 2). If the halomethane concentration in the sample was expected to fall in the lower half of the calibration curve, the sample was spiked at a level approximately equal to the concentration of the compounds already present. If the sample concentration was anticipated to be above that of the midway point of the calibration curve, the spike was approximately half of the value expected in the sample.

TOX Analysis

The quality-control program associated with the TOX analysis (TOX = POX + NPCAOX) consisted of daily method recovery samples, spikes, and duplicate samples. Chloroform was chosen to represent a typical POX compound and trichlorophenol to represent a typical NPCAOX compound. The recovery of each compound (method recovery) was determined each day samples were analyzed. Duplicate sample analyses were performed periodically (approximately every 15 samples) and various spiked samples were analyzed to confirm the accuracy of the TOX method.

Silver Analysis

The quality-control program for silver analysis was conducted concurrently with individual silver analyses. QA/QC samples representing 10 percent of the total number of samples for silver analysis were analyzed. These QA/QC samples included duplicate samples, spiked samples, and quality-control standards.

SECTION 4

SURFACE WATER STUDY RESULTS

ACTIVATED CARBON UNIT STUDIES

Overview of Activated Carbon Unit Study

In the surface water study, New Orleans tap water was chosen to represent a treated (chlorinated) surface water source (Mississippi River) of drinking water. Ten models of activated-carbon home water treatment units (the same models tested in the groundwater study and reported in the Phase 3/ Final Report) were selected and evaluated. Each model was challenged with spiked and pH adjusted (pH ranged between 6.5-7.5) New Orleans tap water during duplicate test runs at the GSRI laboratory. The spiked compounds were 1,1,1-trichloroethane, carbon tetrachloride, trichloroethylene, tetrachloroethylene, p-dichlorobenzene, hexachlorobenzene, and chlordane. The target level of each spiked compound was 50,20,50,50,10,10, and 50 mg/l (ppb), respectively. In addition, the four trihalomethanes (chloroform, dichlorobromomethane, dibromochloromethane, and bromoform) normally present in New Orleans tap water were in the challenge water. Performance parameters monitored were the seven spiked compounds plus the four THM, collectively called halogenated organics (HO), and the total organic halide (TOX). Other complimentary data, including gallons of water processed, water temperature, and time and date of sampling, were determined and recorded for each unit.

The performance testing and sampling schedule used in the surface water study of activated carbon units deviated from the protocols previously described in the experimental section in one respect; a range finding run was not performed.

Results of the Activated Carbon Unit Study

Halogenated Organics (HO) Removal--

The summary performance of each home water treatment model is reported in Table 3 and Figure 4. The data indicate that the selected models (at least one model from each of four basic configurations) were effective in removing the spiked level of HO from New Orleans tap water (49-99 percent). The summary data of HO removal indicate that line-bypass units, generally, are more effective in removing HO from spiked New Orleans tap water than are stationary, faucet-mount, or pour-through units. Line-bypass units removed from 65 to 99 percent HO; whereas, the stationary unit removed 49 percent; faucet-mount units, 50 and 60 percent; and the pour-through unit, 66 percent. A plausible explanation of these results is that line-bypass units generally contain more activated carbon and have larger rated capacities than the other three types. Efforts to compare models with one another may result in biased interpretations unless the various experimental and individual unit parameters, such as design features, capacity, flow rate, and challenge water HO levels, are considered. It must also be noted that many of the test units have not been designed to remove HO, but have been designed to remove only

TABLE 3. SUMMARY PERFORMANCE: TOTAL HALOGENATED ORGANICS REMOVAL DURING RATED LIFETIME FOR LINE-BYPASS FAUCET-MOUNT, STATIONARY, AND POUR-THROUGH UNITS IN THE SURFACE WATER STUDY

WATER STUDY					
Unit	Rated capacity (gallons/liters)	Average influent concentration (ppb)	Total influent load (g)	Amount removed by activated carbon	
				(g)	(%)
<u>Line bypass</u>					
Aqualux-CB-2	2000/7571	348	2.63	2.34	89
Continental	720/2725	338	0.92	0.91	99
Culligan	4000/15142	331	5.01	3.26	65
Everpure*	1000/3785*	347	1.31	1.30	99*
Seagull IV*	1000/3785*	361	1.35	0.98	73*
Aquacell	2000/7571	361	2.73	2.35	86
<u>Faucet-Mount</u>					
Hurley Town and Country	4000/15142	345	5.22	3.13	60
Water Washer	1000/3785	362	1.37	0.69	50
<u>Pour-Through</u>					
Filbrook	500/1892	364	0.69	0.46	66
<u>Stationary</u>					
Sears Taste and Odor	3000/11356	336	3.82	1.87	49

* Unit plugged prematurely; consequently experimental values are estimated from partial data

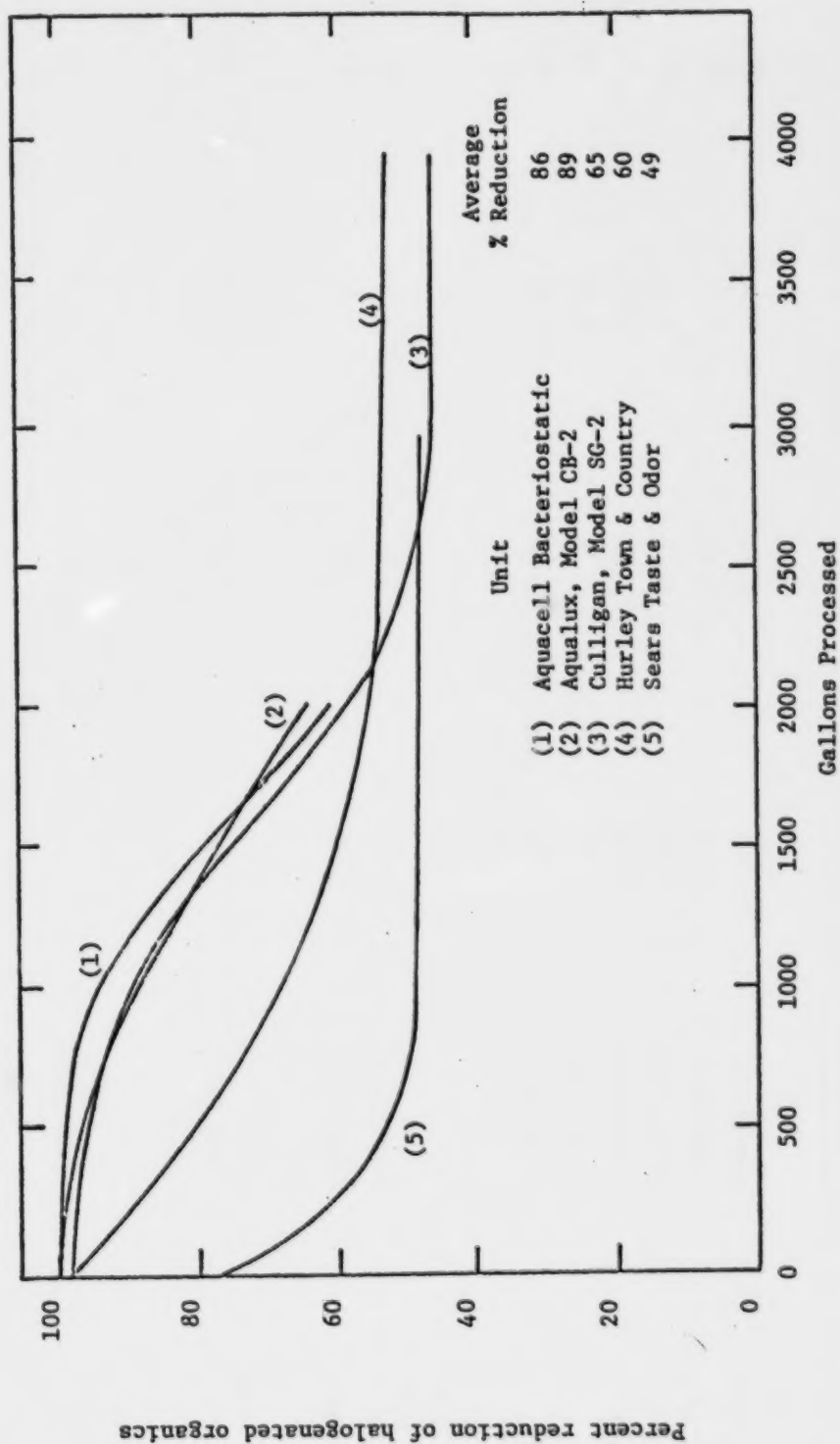


Figure 4. Summary performance of activated-carbon units for halogenated organics removal.

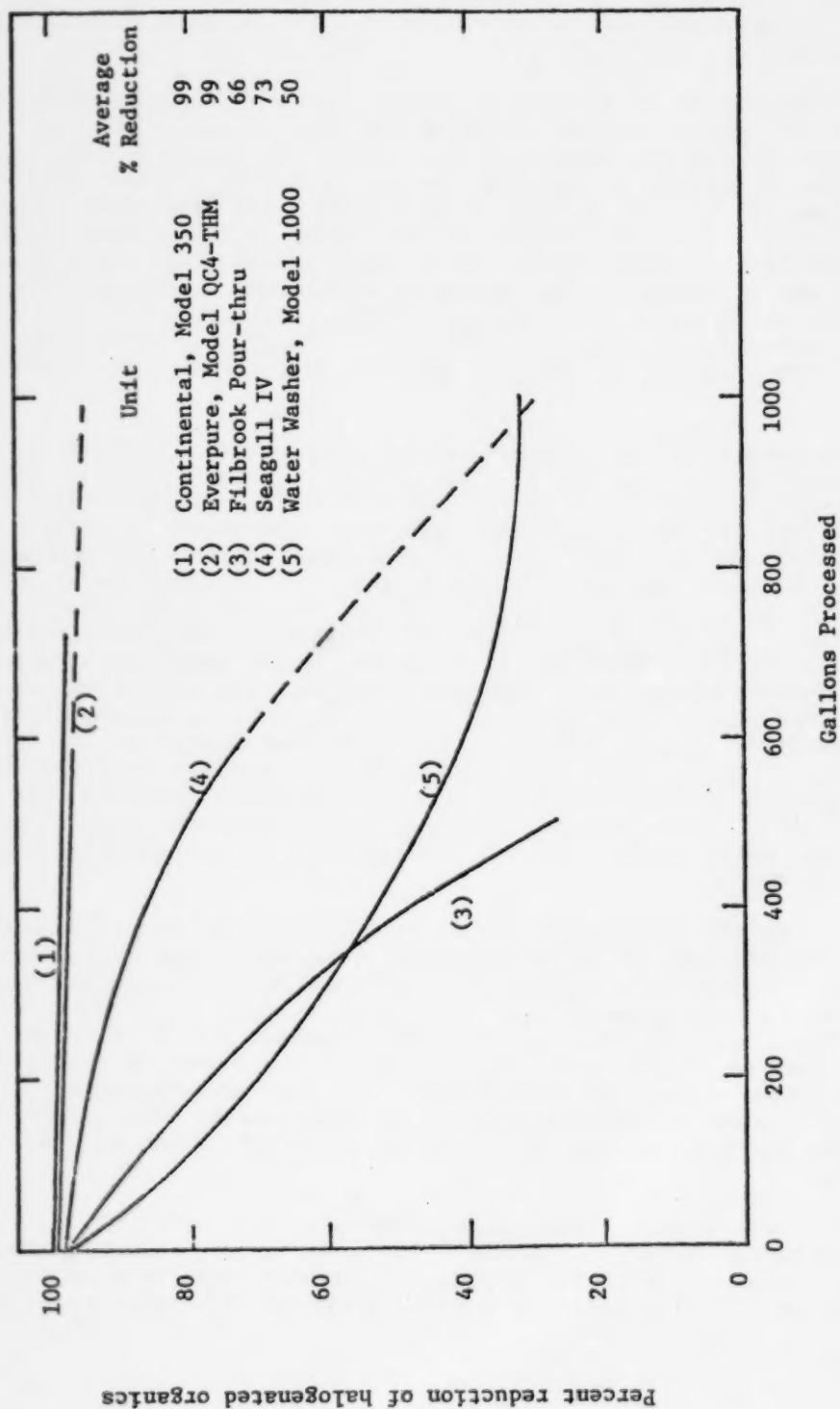


Figure 4. (continued).

taste and odor from water. Summary Table 3 is organized according to type of model since units within each category are designed to operate generally in the same manner.

Unit effectiveness in removing HO was determined by plotting the percent reduction of HO versus gallons processed for each of two trial runs. The unit averages of the two replicate test appear in Figure 4. Percent HO reduction was calculated by dividing the area under the average curve with the total area of the plot (gallons x 100 percent). An additional criterion used to evaluate the effectiveness of HO removal is the amount of HO(g) removed (average influent load x unit rate gallon capacity x percent reduction = amount removed). The amount of HO removed is determined by the average influent HO spike concentration, which varied from 315 to 411 ppb during the surface water study. In addition, if comparisons between types of units are made, amount as well as percent reduction of HO should be considered.

Table 4 summarizes the organic removal data with the percent removal values calculated for the THM fraction and the average range of percent removals listed for each of the spiked chemicals in the challenge water. THM reduction levels were generally lower than those experienced in Phase 2 test using identical models. This decrease is probably due to the presence of overwhelming levels of methanol in the challenge water. Estimates of 170 ppm methanol were made for the concentration in the challenge water. This organic burden is approximately 20-100 times that which might occasionally be found in drinking water supplies in the United States (based on nonspecific organic carbon measurements). Some model carbon units were affected much more than other units. This can be expected with filters utilizing different type carbons which in turn have different adsorption capacities and varying responses to different type chemical compounds. Although this experiment does not represent any expected "real life" contamination situation, the test do provide a very interesting and assuring insight into the versatility and tolerance activated carbon filters demonstrate toward adverse organic contamination levels.

Chloroform, the predominant THM in New Orleans tap water (range 86.8-130 ppb), was generally the first compound to "break through" the activated-carbon units. Spiked 1,1,1-trichloroethane (range 38.7-71.7 ppb) was usually observed in effluent samples concurrently or shortly after CHCl_3 breakthrough. The larger and more polar spiked compounds were usually the last compounds observed in effluent samples. Chlorodane (range 20.4-72.3 ppb), trichloroethylene (range 36.2-78.9 ppb), and tetrachloroethylene (range 28.2-57.3 ppb) were effectively removed by most units. The original HO removal data for each trial of each unit are presented in Appendix Tables A4 through A23.

Nonpurgeable Total Organic Carbon (NPTOC) Removal--

As previously mentioned, methanol was used as an organic carrier in spiked New Orleans tap water and accounted for greater than 99 percent of the total NPTOC level of the challenge water. Since the determination of NPTOC

TABLE 4. SELECTED HALOGENATED ORGANICS REMOVAL DURING RATED LIFETIME FOR THE LINE-BYPASS,
FAUCET-MOUNT, STATIONARY, AND POUR-THROUGH UNITS IN THE SURFACE WATER STUDY

Test Unit	Rated capacity (gallons/liters)	Average % THM reduction	Average influent challenge (ppb)	Range of average HO reduction %(gallone)	Average influent HO during test (ppb)
Aqualux Model CB-2	2000/7570	77	135	A - 99(14) to 65(2000)	55
				B - 99(14) to 54(2000)	15
				C - 99(14) to 95(2000)	61
				D - 99(14) to 89(2000)	34
				E - 99(14) to 90(2000)	93
				F - 99(14) to 54(2000)	82
				G - 99(14) to 89(2000)	46
Aqua Cell Bacteriostatic	2000/7570	77	137	A - 99(30) to 82(2000)	57
				B - 99(30) to 78(2000)	15
				C - 99(30) to 80(2000)	61
				D - 99(30) to 94(2000)	34
				E - 99(30) to 96(2000)	92
				F - 99(30) to 80(2000)	69
				G - 99(30) to 89(2000)	42
Continental Model 350	720/2725	98	129	A - 99(6) to 99(720)	51
				B - 99(6) to 95(720)	16
				C - 99(6) to 99(720)	49
				D - 99(6) to 99(720)	39
				E - 95(6) to 99(720)	10
				F - 85(6) to 95(720)	88
				G - 99(6) to 99(720)	43
Culligan Model SG-2	4000/15140	49	139	A - 99(31) to 73(4000)	52
				B - 99(31) to 69(4000)	14
				C - 98(31) to 81(4000)	58
				D - 99(31) to 84(4000)	33
				E - 77(31) to 89(4000)	9.1

(continued)

TABLE 4 (continued)

Test Unit	Rated capacity (gallons/liters)	Average % THM reduction	Average influent challenge (ppb)	Range of average HO reduction %(gallons)	Average influent HO during test (ppb)
Hurley Town & Country	4000/15140	35	134	F - 99(31) to 45(4000)	8.3
				G - 95(31) to 83(4000)	47
				A - 99(11) to 60(4000)	56
				B - 99(11) to 77(4000)	15
				C - 99(11) to 92(4000)	57
				D - 99(11) to 93(4000)	36
				E - 99(11) to 92(4000)	9.5
				F - 99(11) to 50(4000)	8.4
Water Washer Model 1000	1000/3785	24	136	G - 99(11) to 79(4000)	45
				A - 96(4) to 25(1000)	54
				B - 96(4) to 60(1000)	14
				C - 96(4) to 57(1000)	60
				D - 98(4) to 60(1000)	35
				E - 99(4) to 60(1000)	9.2
				F - 50(4) to 20(1000)	8.2
				G - 96(4) to 60(1000)	47
Filbrook	300/1136	82	138	A - 99(2) to 40(300)	58
				B - 99(2) to 35(300)	15
				C - 99(2) to 56(300)	60
				D - 98(2) to 63(300)	33
				E - 99(2) to 75(300)	9.1
				F - 99(2) to 40(300)	6.5
				G - 99(2) to 45(300)	39
Sears Taste & Odor	3000/11300	24	132	A - 80(20) to 50(3000)	49
				B - 64(20) to 50(3000)	13
				C - 70(20) to 90(3000)	48
				D - 72(20) to 82(3000)	38
				E - 79(20) to 88(3000)	9.9

(continued)

TABLE 4 (continued).

Test Unit	Rated capacity (gallons/liters)	Average % THM reduction	Average influent challenge (ppb)	Range of average HO reduction %(gallorage)	Average influent HO during test (ppb)
Everpure QC4-THM	1000/3785	99(10) to 95(500)	133	F - 51(20) to 30(3000)	8.9
				G - 78(20) to 35(3000)	42
	----unit plugged prematurely----			A - 99(10) to 95(600)	54
				B - 99(10) to 95(600)	14
				C - 99(10) to 99(600)	57
				D - 99(10) to 99(600)	36
				E - 99(10) to 99(600)	9.3
				F - 99(10) to 99(600)	8.5
Seagull IV	1000/3785	99(30) to 40(550)	133	G - 99(10) to 99(600)	43
				A - 99(30) to 98(550)	54
	----unit plugged prematurely----			B - 99(30) to 96(550)	14
				C - 99(30) to 99(550)	57
				D - 99(30) to 99(550)	36
				E - 99(30) to 99(550)	9.5
				F - 99(30) to 99(550)	8.5
				G - 99(30) to 98(550)	43

A = 1,1,1-Trichloroethane ($\text{Cl}_3\text{C:CH}_3$)
 B = Carbon Tetrachloride (CCl_4)
 C = Trichloroethylene ($\text{Cl}_2\text{C:CHCl}$)
 D = Tetrachloroethylene ($\text{Cl}_2\text{C:CCl}_2$)
 E = p-Dichlorobenzene ($\text{C}_6\text{H}_4\text{Cl}_2$)
 F = Hexachlorobenzene (C_6Cl_6)
 G = Chlodane (Technical grade, 60%)

reduction would only reflect the reduction of methanol (much of CH_3OH reduction is due to evaporation), NPTOC reduction was not determined in this study. Realistic values for NPTOC reduction for respective units in this study have been reported in the Phase 1 and Phase 2 reports.

Nonpurgeable Carbon Adsorbable Organic Halide (NPCOAX) Removal--

Total organic halide (TOX) is defined by the sum of purgeable organic halide (POX) and nonpurgeable carbon adsorbably organic halide (NPCOAX), ($\text{TOX} = \text{POX} + \text{NPCOAX}$). Both POX and NPCOAX levels reported in the surface water study are comprised of varying amounts of the four THM, the seven spiked compounds, and unknown organic halides. NPCOAX influent levels of spiked New Orleans tap water ranged between 98 and 202 ppb, (average 154 ± 46 ppb), and NPCOAX effluent sample levels from respective units ranged between 4 and 190 ppb. Generally, the calculation of percent NPCOAX reduction involves the comparison of influent and effluent samples collected on or near the same day; however, only five influent NPCOAX samples were analyzed (contract limitations) during the 75 day testing period. Since the limited number of influent samples did not permit the day to day description of challenge water, many of the data sets of NPCOAX reduction were determined using estimated or average NPCOAX influent levels was reflected, in part, by the scattered pattern of NPCOAX data sets for most of the respective units (i.e., some data sets indicated NPCOAX addition). Generally data sets of NPCOAX for respective units appeared 20 to 30 percent below the corresponding data sets (sampling date) obtained from the HO data previously reported. Construction of NPCOAX reduction curves for the respective units or comparison of units with one another would require approximations or assumptions concerning the NPCOAX data which may not have good experimental foundations or analogs. The original NPCOAX data of each unit in the surface water study are listed in the Appendix in Tables A2 and A32.

The influent level of spiked halogenated organics in the surface water study ranged between 315 and 411 ppb (average level = 361 ± 26 ppb). The influent level of TOX in the surface water study ranged between 340 and 451 ppb (average level = 404 ± 40 ppb). The different values for average HO and TOX levels (361 and 404, respectively) are consistent with the following rationale. HO values determined by GC/ECD were derived from the specific analysis of 11 compounds (four THM plus the seven spiked compounds). TOX values determined by the Dohrmann Model DX-20 analyzer were derived from the nonspecific analysis of all halogenated compounds present in spiked New Orleans tap water (four THM, seven spiked compounds, and unknown organic halides). Consequently, the higher TOX values from the DX-20 analyzer imply the presence of unknown organic halides in New Orleans tap water; however, the magnitude of unknown organic halide levels cannot be accurately deduced from the data obtained from spiked New Orleans tap water.

The validity of the data must be further qualified as a result of unpublished experimental results from the USEPA detailing sample instability problems. These test results suggest the TOX levels may decrease as much as 35% upon extended storage (approximately three months). The vast majority of these TOX losses occur during the first 7 days of storage. With cold

storage, the sample TOX losses were kept to a minimum of 15 percent over a 28-day period. Not enough work has been completed in this area to attempt to correct the carbon filter TOX values for storage losses. These ambiguities in the TOX data further prevent meaningful detailed analysis of the data to be made. In light of these confounding factors, caution should be exercised in interpreting the data.

NONCARBON UNIT STUDY

Overview of Noncarbon Unit Study

The home water treatment units previously tested in Phase 1 and 2 utilized adsorptive processes for their operation. The majority of units used activated-carbon while one unit used a synthetic resin. Alternate technologies have been developed and are currently promoted in the field of home water treatment. Some of the alternate technologies include membrane filtration (reverse osmosis), distillation, ozonization, and ultraviolet treatment. These treatments are used individually or in conjunction with activated carbon to achieve various degrees of water purification. This group of treatment devices is described in the current report as noncarbon units because their contaminant removal capabilities are not primarily based on carbon-adsorption. The noncarbon unit element of the current study was performed to determine the effectiveness of alternate treatment technologies in the reduction of organics from drinking water.

Two different models of reverse-osmosis units, one ozonator, and one ultraviolet unit were evaluated. All the noncarbon units employed activated-carbon at some point in their treatment processes. A description of the noncarbon treatment systems is provided in the experimental section of this report. Each model was challenged with organically spiked and pH-adjusted (pH ranged between 6.5 and 7.5) New Orleans tap water during duplicate test runs at the GSRI laboratory. The spiked compounds were 1,1,1-trichloroethane, carbon tetrachloride, trichloroethylene, tetrachloroethylene, p-dichlorobenzene, hexachlorobenzene, and chlordane. The target level of each spiked compound was 50,20,50,50,10,10, and 50 mg/l (ppb), respectively. In addition, the four trihalomethanes (chloroform, dichlorobromomethane, dibromochloromethane, and bromoform) normally present in New Orleans tap were in the challenge water. Performance parameters monitored were 1) the seven spiked HO constituents, 2) the four THM compounds, and 3) TOX. The performance testing and sampling schedules in the noncarbon unit study are described in the experimental protocols.

Experimental Protocols

Since the four noncarbon units differed in function and operation, they were considered separately in the establishment of appropriate test protocols. The testing protocols and their rationale are discussed below.

Reverse-Osmosis Units --

Reverse-osmosis units were usually operated continually because of their low production rate. A reservoir was included in the system to accumulate product water and to supply it to the consumer at an acceptable rate. The only time the treatment (production) of water stopped was when the reservoir filled to the point that back pressure equaled tap water pressure. Generally, the quality of treated water should improve as the pressure difference between the tap and the treated water side of the membrane is increased. Consequently, the purest water would be produced when the reservoir was empty, and the least pure water when the reservoir was nearly full. The sampling schedule was designed to collect a reasonable mix of the two extremes in treated water quality. Two factors were important in the sample collection schedule: time of day within the automatic cycling regime and scheduling of sampling during the testing period. The RO units were cycled "on" for 6 min each hr for 16 hr, and then "off" for 8 hr. The samples were collected during the 8 hr stagnation period just before the beginning of the next 16 hr cycling period. The duration of testing period was determined by contract deadlines and the recognition that the RO unit's membranes and the activated-carbon filters degrade very slowly. Consequently, RO samples were collected about once a week for 12 weeks.

Ozonization Unit --

The Ozomatic Water Purifier was the only ozone-related unit evaluated. The unit bubbled ozone through the sample and the treated water passed through a sediment and a carbon filter as it was dispensed. The ozonization unit was evaluated (in duplicate) by cycling at least two batches of challenge water (1.5 gallon/batch) through respective units each day. The test period was approximately one month; it was anticipated that any decrease in RO removal efficiency was a result of the deterioration of the activated-carbon cartridge. The suggested lifetime of the ozone generator (200 hr of operation) was not approached in the present study.

Ultraviolet Water Conditioning System --

The Model CW-5 water conditioner utilized high-intensity ultraviolet radiation for proposed bacterial, algae, and viral destruction. The unit also incorporated activated-carbon filters for the removal of organic and taste and odor components. The Model CW-5 was cycled on and off for 16 hr a day as were the RO systems (6 min/hr x 16 hr/day = 96 min/day process time). Duplicate units were stagnated overnight for 8 hr and sampled just before the 16 hr challenge cycle. The evaluation period was approximately one month, and sampling was scattered throughout the test period. Significantly more water was processed by the CW-5 systems than by the other noncarbon units during the Phase 3 study. This was due to the relatively high production rate of the CW-5 system when compared with the other noncarbon devices. The CW-5 units were rated by the manufacturer at 5000 gallons, or one year (4 gal/day x 30 day/month x 12 month/yr = 1400 gal/yr) whichever comes first. Both CW-5 units were run for approximately 2700 gallons.

Results of Noncarbon Unit Study

General Observations--

The noncarbon water treatment units evaluated in Phase 3 of this program utilized several treatment processes other than activated-carbon; (i.e., reverse osmosis membrane filtration, ozonization, and ultraviolet conditioning). Consequently, the noncarbon units were not expected to exhibit rapid deterioration of contaminant removal capabilities even though each model incorporated activated-carbon in their overall water treatment system. The test periods were scheduled to maximize the gallons of water processed and to complete the testing within contract deadlines. The reverse-osmosis units were run for three months while the remaining noncarbon units were tested for approximately one month. Challenge water quality (organic) during the test period is presented in Tables A1 through A3 in the Appendix. Peripheral data (operating parameters of respective units) are presented in Appendix Table A34.

The main objective of the noncarbon study was to evaluate the effectiveness of the various units in removing organic compounds from water, specifically, the spiked HO and THM substances in New Orleans tap water. For summary purposes, the total concentration of the 11 HO was used to calculate percent of HO reduction. Comparisons of the noncarbon units with one another are difficult since respective unit capacities or related lifetimes are not comparable. In addition, the systems were not challenged with large volumes of water due to the "batch-sample" nature of their operation. Figure 5 illustrates the percent HO reduction for all the noncarbon units. The data sets in Figure 5 were separated into four plots because of large differences in volume of processed water. The four plots were not constructed to facilitate direct comparisons of units. Figure 6 shows the respective data sets of noncarbon units for NPCAOX removal. Since NPCAOX data sets, as represented in Figure 6, were heavily influenced by average influent NPCAOX levels (which were determined from 5 points), NPCAOX data should be interpreted cautiously.

Tables A24 through A31 list the original data for HO reduction for each of the respective units. Tables A33 presents the original NPCAOX data for each unit evaluated in the noncarbon unit study. The following discussion is divided into the four classes of noncarbon units evaluated. Each section highlights any unusual or interesting results from the respective units.

Reverse-Osmosis Units--

The Aqua Cleer-THM unit was effective in removing HO (data sets range between 92 and 99 percent) (Figure 5), while the Water Purification System Inc.'s Unit exhibited HO reduction curves similar to activated-carbon reduction curves (data sets range between 35 and 75 percent). The WPSI-UTC-5 unit demonstrated significantly better reduction of NPCAOX than HO. This observation indicated that the membrane filtration component of the system was effective but had low rejection of the smaller more membrane-soluble compounds including chloroform, the compound of highest concentration in the challenge water.

Percent Reduction of Halogenated Organics

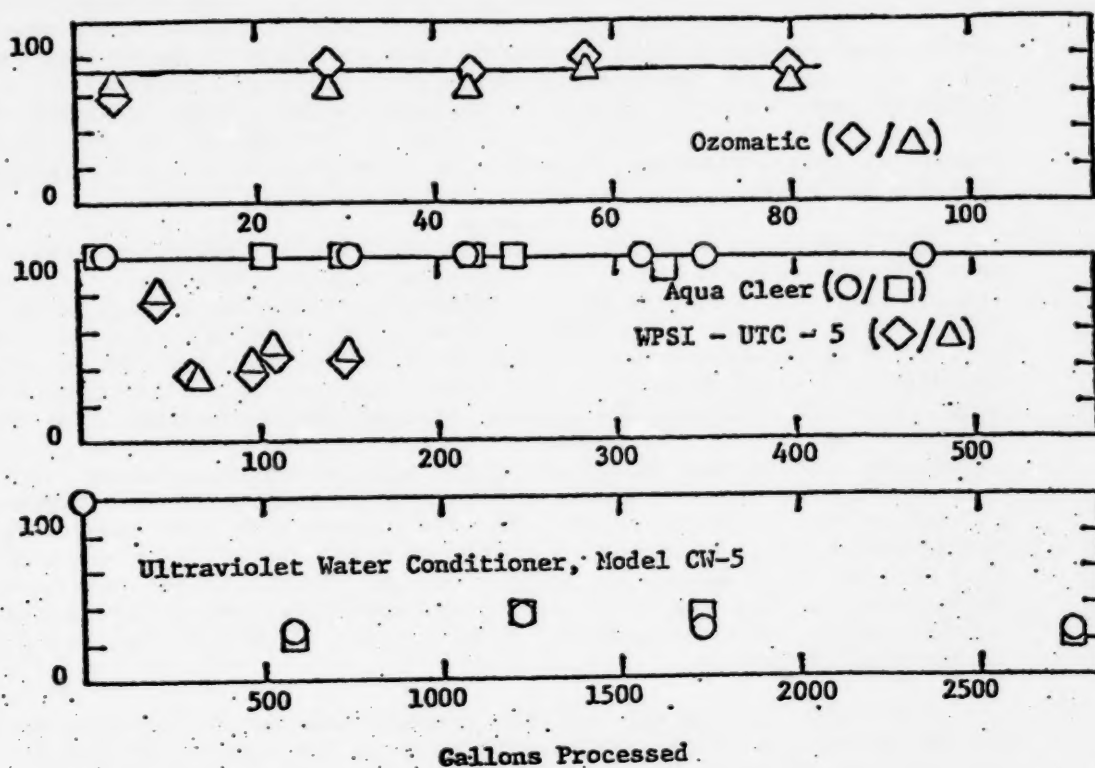


Figure 5. Summary performance of other units for halogenated organics removal.

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Chloroform concentrations were not reflected in reported NPCAOX levels but were reflected (up to 40 percent) in HO levels. The design of the carbon adsorption component of the WPSI-UTC-5 system provided for short contact times, thus permitting chloroform to pass through the carbon filtration component; consequently, HO levels in effluent sample were significantly raised. The Aqua Cleer system's carbon adsorption component permitted extended contact time of the sample with the carbon filter, thereby substantially improving the removal of chloroform and other HO. The data sets of NPCAOX reduction for the Aqua Cleer and WPSI-UTC-5 ranged between 94 and 99 percent and 84 and 96 percent reduction, respectively (Figure 6).

Ozonization Unit--

The Ozomatic Water Purifier reduced HO by approximately 70 percent. The HO reduction curve (Figure 5) indicated consistent reduction over time and the volume of water processed. The HO data sets ranged from 58 to 78 percent. The NPCAOX data sets exhibited consistently lower reduction (<40 percent in Figure 6), and data sets ranged from 4 to 36 percent. The HO and NPCAOX results presented a confusing picture: the more specific HO analysis indicated appreciable reduction of the nonvolatile HO (NPCAOX are also considered to be nonvolatile HO) while the nonspecific NPCAOX analysis indicated minimal NPCAOX reduction. A plausible explanation for this ambiguity is that the spiked HO may have been chemically altered by the ozonization process and therefore were not detected by the GC/ECD as the respective spiked compound, whereas, chemical breakdown of HO may not affect NPCAOX levels (nonspecific measurement). Typical ozone type odors were present in the atmosphere around the unit and in the product water. The odor in the product water quickly disappeared. Chemical tests confirmed these observations with as high as 3 ppm being detected in the product water immediately after ozonization. The level was below the detection limit within 1 hr after exposure.

Ultraviolet Water Conditioning Unit--

The Ultraviolet Water Conditioner, Model CW-5 reduced HO in a pattern similar to activated-carbon adsorption curves (Figure 5). This observation may indicate that the carbon filter in the unit was the major design feature in HO reduction. Data sets for HO reduction ranged from 21 to 98 percent. The average NPCAOX reduction was less than 10 percent with data sets ranging from 0 to 4 percent (Figure 6). The low HO and NPCAOX reduction results were probably due to the design of the system, which allowed little time for the sample in the UV reaction chamber as well as short contact time with the carbon filter. As with ozonization, there appeared to be chemical modification of the spiked HO, particularly isomer ratio shifts of chlordane. Examination of the GC/ECD chromatograms indicated changes in specific isomer ratios of chlordane. This occurrence may have resulted in effluent chlordane levels to be reported at values lower than those actually present. This phenomenon was not investigated further and did not significantly affect the reported HO reduction results.

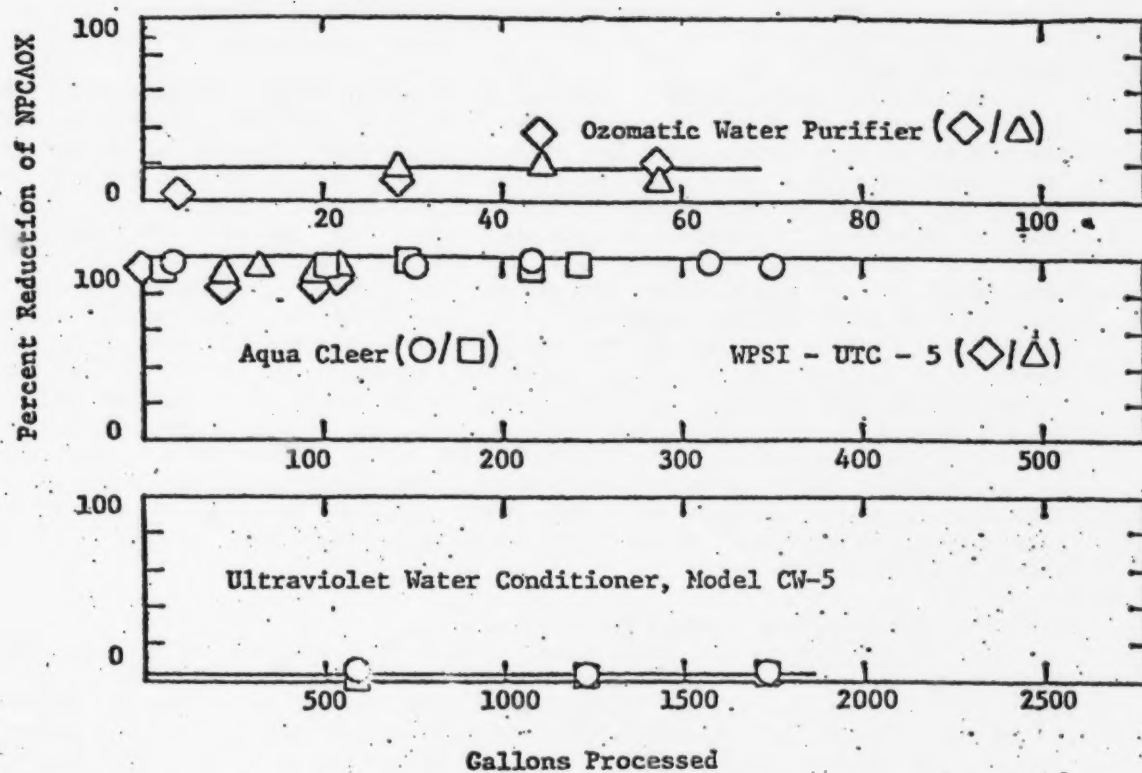


Figure 6. Summary performance of other units for NPCAOX removal.

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2. Gunther, F.A., W.E. Westlake, and T.L. Jaglan, Residue Reviews, 20:1, (1968).
3. "The Analysis of Trihalomethanes in Drinking Water by Liquid/liquid Extraction," Environmental Monitoring and Support Laboratory, EPA, Cincinnati, Ohio, September 8, 1977.
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TABLE A1. TRIHALOMETHANE AND SPIKED HALOGENATED ORGANICS CONCENTRATIONS IN SPIKED NEW ORLEANS TAP WATER

Date	Trihalomethanes (ppb)				Total (1-4)	Spiked Halogenated Organics (ppb)											Total (1-11)
	1	2	3	4		5	6	7	8	Total (5-8)	9	10	11	Total (9-11)			
9-26-80	114	23.4	7.6	*	145	50.1	13.9	47.9	41.2	153	9.6	4.9	20.4	34.9	333		
10-6-80	108	17.6	4.9	*	131	56.1	14.3	56.6	28.8	156	8.6	3.8	26.4	38.8	326		
10-7-80	108	15.6	4.9	*	128	56.2	14.3	52.2	(28.6)	152	7.1	3.5	27.2	37.8	318		
10-8-80	109	18.6	5.4	*	133	60.5	15.7	56.6	28.2	161	(7.8)	(6.2)	(29.1)	43.1	337		
10-9-80	120	18.6	5.4	*	144	63.2	15.6	54.4	(29.1)	162	8.6	8.9	31.0	48.8	355		
10-10-80	128	20.5	5.4	*	154	65.1	17.3	60.9	30.1	173	9.7	5.8	42.9	58.4	385		
10-13-80	115	20.5	5.3	*	141	57.5	14.5	67.4	34.3	174	10.8	4.6	26.4	41.8	357		
10-14-80	116	16.6	4.0	*	137	61.0	15.2	65.3	36.1	178	(10.4)	(7.7)	(39.9)	58.0	373		
10-15-80	120	15.3	3.7	*	139	61.7	15.6	67.1	37.4	181	9.9	10.8	53.7	74.4	394		
10-16-80	106	13.4	3.3	*	123	52.4	13.0	52.2	34.0	152	(9.6)	(8.9)	(61.9)	80.4	355		
10-17-80	122	16.6	3.7	*	142	50.9	12.5	74.6	31.0	169	9.3	6.9	70.2	86.4	397		
10-20-80	116	15.3	3.3	*	135	60.6	15.7	67.1	38.5	182	8.2	6.1	40.3	54.6	372		
10-21-80	118	16.0	3.7	*	138	54.2	14.9	61.5	36.4	167	9.1	8.1	51.6	68.8	374		
10-22-80	110	14.7	2.9	*	128	52.1	14.2	76.4	31.5	174	7.4	8.4	37.2	53	355		
10-23-80	117	16.6	3.7	*	137	52.1	15.0	59.7	35.0	162	10.7	7.7	60.9	79.3	378		
10-24-80	117	16.6	2.9	*	136	53.7	15.4	61.5	36.6	167	10.3	7.5	57.8	75.6	379		
10-27-80	114	16.6	3.3	*	134	54.4	15.5	65.3	37.9	173	10.3	8.6	72.3	91.2	398		
10-29-80	111	12.8	2.6	*	126	55.3	15.4	63.4	38.3	172	9.9	12.4	59.9	82.2	380		
10-30-80	107	12.8	2.2	*	122	49.1	13.6	55.9	35.8	154	9.5	13.8	60.9	84.2	360		
10-31-80	104	10.9	1.8	*	117	46.8	12.9	70.8	33.0	164	(9.5)	(12.5)	(50.4)	72.4	353		
11-1-80	114	23.0	5.9	*	143	48.0	13.5	55.9	33.7	151	9.5	11.3	40.3	61.1	355		
11-3-80	106	27.5	8.1	*	142	41.9	12.1	48.5	31.2	134	8.3	11.4	55.7	75.4	341		
11-4-80	106	27.5	8.1	*	142	41.9	12.1	48.5	31.2	134	8.3	8.2	53.8	70.3	349		
11-5-80	112	25.5	7.7	*	145	41.1	12.3	48.5	32.2	134	8.3	8.2	53.8	70.3	349		
11-7-80	112	20.4	5.5	*	138	(40.1)	(11.5)	(46.6)	(30.6)	129	8.1	8.6	47.5	64.2	331		
11-10-80	103	19.2	5.5	*	128	39.1	10.6	44.7	29.0	123	8.8	9.4	53.8	72.0	323		
11-11-80	110	20.4	5.9	*	136	39.4	11.1	48.9	28.9	128	7.8	8.9	47.5	64.2	328		
11-12-80	96.3	19.8	5.9	*	122	38.7	11.2	44.7	31.1	126	9.0	10.7	47.5	67.2	315		
11-13-80	100	26.2	5.9	*	132	45.4	13.0	48.5	33.6	140	9.3	6.3	39.4	55	327		
11-14-80	113	25.5	8.1	*	147	48.0	15.7	50.3	36.1	150	10.7	9.6	42.6	62.9	360		
11-17-80	102	23.0	7.7	*	133	60.0	18.1	63.4	46.6	188	12.2	9.2	45.7	67.1	388		
11-18-80	107	17.7	5.5	*	130	45.9	(18.0)	(49.8)	(44.6)	158	10.5	9.4	37.6	57.5	346		
11-19-80	86.8	18.3	6.2	*	111	56.2	18.0	56.2	42.6	153	10.6	9.4	37.4	57.4	321		

continued

(continued)

TABLE A1. (continued)

Date	Trihalomethanes (ppb)					Spiked Halogenated Organics (ppb)							Total (1-11)		
	1	2	3	4	Total (1-4)	5	6	7	8	Total (5-8)	9	10		Total (9-11)	
11-20-80	99.6	17.3	5.3	*	122	71.7	23.9	52.9	54.6	203	12.7	6.5	30.5	49.7	375
11-21-80	99.4	22.1	4.8	*	126	65.4	15.5	46.9	49.9	178	12.0	8.3	45.2	65.6	370
11-24-80	110	16.7	5.8	*	133	54.4	22.7	68.4	50.5	196	(10.8)	(7.3)	(35.7)	53.8	383
12-1-80	130	16.7	4.5	*	151	54.6	23.4	68.4	51.3	198	9.5	6.2	24.2	39.9	389
12-4-80	129	12.5	3.2	*	145	52.7	23.6	68.4	47.0	192	11.0	(8.7)	(84.6)	54.3	391
12-11-80	102	17.5	5.3	*	125	54.6	26.8	78.9	57.3	218	12.2	11.2	44.9	68.3	411

*Influent level <0.5 ppb.

Parentheses denote average of influent level before and after the sample date.

1 = Chloroform

2 = Dichlorobromomethane

3 = Dibromochloromethane

4 = Bromoform

5 = 1,1,1-Trichloroethane

6 = Carbon Tetrachloride

7 = Trichloroethylene

8 = Tetrachloroethylene

9 = p-Dichlorobenzene

10 = Hexachlorobenzene

11 = Chlordane (Technical grade)

TABLE A2. TOTAL ORGANIC HALIDE (TOX) OF CONTROL LOOP EFFLUENT AND/OR INFLUENT WATER IN THE SURFACE WATER STUDY (NEW ORLEANS TAP WATER).

Date	Total organic halide (TOX) ¹ (g/liter)	
	NPCAOX	TOX
9-11-80	85	337
9-11-80	115	376
10-06-80	--	--
10-22-80	193	415
11-05-80	202	451
11-17-80	161	410
11-19-80	98	340
11-20-80	115	406

¹ = total organic halide (TOX) = purgeable organic halide (POX) + nonpurgeable carbon adsorbable organic halide (NPCAOX).

TABLE A3. CHALLENGE WATER QUALITY FOR THE GROUND WATER, SURFACE WATER AND NONCARBON UNIT STUDIES

Constituent	Ground Water Source		Surface Water Source		Method of Analysis Method of Analysis (detection limit)
	Sample concentration (before study)	Sample concentration (after study)	Sample concentration (before study)	Sample concentration (after study)	
PRIMARY DRINKING WATER REGULATION CONSTITUENTS					
Arsenic	ND	ND	ND	ND	FAAS (5 µg/l)
Barium	ND	ND	ND	ND	FAAS (42 µg/l)
Cadmium	ND	ND	ND	ND	FAAS (5 µg/l)
Chromium	ND	ND	ND	ND	FAAS (5 µg/l)
Lead	ND	ND	ND	ND	FAAS (5 µg/l)
Mercury	ND	ND	ND	ND	FAAS (0.2 µg/l)
Selenium	ND	ND	ND	ND	FAAS (5 µg/l)
Silver	ND	ND	ND	ND	FAAS (1 µg/l)
Nitrate (ASN)	--	--	1.1	0.8	cadmium reduction
Fluoride	--	--	1.1	1.0	specification electrode
Endrin	ND	ND	ND	ND	EC-GC (0.002 µg/l)
Lindane	ND	ND	ND	ND	EC-GC (0.002 µg/l)
Methoxychlor	ND	ND	ND	ND	EC-GC (0.002 µg/l)
Toxaphene	ND	ND	ND	ND	EC-GC (0.1 µg/l)
2,4-D	ND	ND	ND	ND	EC-GC (0.03 µg/l)
2,4,5-TP Silvex	ND	ND	ND	ND	EC-GC (0.02 µg/l)
PROPOSED SECONDARY DRINKING WATER REGULATION CONSTITUENTS					
Chloride	--	--	28	33	argentometric
Color	--	--	--	--	-----
Copper	ND	ND	ND	ND	FAAS (10 µg/l)
Corrosivity	--	--	--	--	-----
Foaming Agents	--	--	--	--	-----
Hydrogen Sulfide	ND	ND	ND	ND	antimony test
Iron	ND	ND	ND	ND	FAAS (30 µg/l)
Manganese	ND	ND	ND	ND	FAAS (15 µg/l)
Odor	--	--	--	--	-----
pH	7.8	7.0	9.4	9.6	pH meter
Sulfate	--	--	50	58	turbidometric
TDS	197	197	255	291	conductivity
Zinc	ND	ND	ND	ND	FAAS (2 µg/l)

(continued)

TABLE A4. ORGANIC CHEMICAL DATA

Unit: Aqualux, Model CB-2, Run Number 3KL3
Spiked New Orleans Tap Water Test at 0.80 gpm Flow Rate

Test date	Gallons processed	1	2	3	4	Total	5	6	7	8	9	10	11	total	Percent reduction halogenated organics
9-26-80	14	*	*	*	*	*	*	*	*	*	*	*	*	*	
		(114)	(23.4)	(7.6)	(*)	(145)	(50.1)	(13.9)	(47.9)	(41.2)	(9.6)	(4.9)	(20.4)	(333)	
Σ reduction						99	99	99	99	99	99	99	99		99
10-10-80	469	9.5	0.7	*	*	10.2	(65.1)	1.2	2.5	1.2	0.6	3.3	6.4	25.4	
		(128)	(20.5)	(5.4)	(*)	(154)	(93)	(17.3)	(60.9)	(30.1)	(9.7)	(5.8)	(42.9)	(385)	
Σ reduction						93	99	93	96	96	93.8	43	85		93
10-17-80	1002	43.9	2.5	0.5	*	46.5	7.9	2.0	0.5	*	*	4.6	10.4	72.3	
		(122)	(16.6)	(3.7)	(*)	(142)	(50.9)	(12.5)	(74.6)	(31.0)	(9.3)	(6.9)	(70.2)	(397)	
Σ reduction						67	84	84	99	99	99	33	85		82
10-27-80	1529	112	7.8	1.2	*	121.4	23.1	5.4	2.2	2.6	*	3.8	11.2	169	
		(114)	(16.6)	(3.3)	(*)	(134)	(54.4)	(15.5)	(65.3)	(37.9)	(10.3)	(8.6)	(72.3)	(398)	
Σ reduction						10	57	65	97	93	99	55.8	84		57
11-4-80	2079	108	10.8	2.3	*	121.1	24.1	5.6	2.4	3.3	0.8	5.2	6.2	169	
		(106)	(27.5)	(8.1)	(*)	(142)	(41.9)	(12.1)	(48.5)	(31.2)	(8.3)	(11.4)	(55.7)	(341)	
Σ reduction						15	42	54	95	89	90	54	89		51
Average halogenated organics influent level during test period															
*Halogenated organics concentration <0.5 ppb.															(348)

- 1 = Chloroform (CHCl₃)
 2 = Dichlorobromomethane (CHCl₂Br)
 3 = Chlorodibromomethane (CHClBr₂)
 4 = Bromoform (CHBr₃)
 5 = 1,1,1-Trichloroethane (CH₃CCl₃)
 6 = Carbon Tetrachloride (CCl₄)

- 7 = Trichloroethylene (Cl₃C:CHCl)
 8 = Tetrachloroethylene (Cl₄C:CCl₂)
 9 = p-Dichlorobenzene (C₆H₄Cl₂)
 10 = Hexachlorobenzene (C₆Cl₆)
 11 = Chlordane (Technical Grade, 60%)

TABLE A5. ORGANIC CHEMICAL DATA

Unit: Aqualux, Model CB-2, Run Number 3KL4 Spiked New Orleans Tap Water Test at 0.80 gpm Flow Rate															
Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)											Percent reduction halogenated organics		
		1	2	3	4	Total	5	6	7	8	9	10		11	total
9-26-80	13	*	*	*	*	*	*	*	*	*	*	*	*	*	99
Σ reduction		(114)	(23.4)	(7.6)	(*)	(145) 99	(50.1) 99	(13.9) 99	(47.9) 99	(41.2) 99	(9.6) 99	(4.9) 99	(20.4) 99	(333)	
10-10-80	573	*	*	*	*	*	*	*	*	*	*	2.4	*	2.4	99
Σ reduction		(128)	(20.5)	(5.4)	(*)	(154) 99	(65.1) 99	(17.3) 99	(60.9) 99	(30.1) 99	(9.7) 99	(5.8) 59	(42.9) 99	(385)	
10-17-80	1000	12.8 (122)	1.1 (16.6)	*	*	13.9 (142) 90	3.8 (50.9) 92	1.3 (12.5) 90	*	(74.6) 99	*	4.0 (6.9) 42	1.6 (70.2) 99	24.6 (397)	94
Σ reduction															
10-27-80	1621	61.9 (114)	2.2 (16.6)	*	*	64.1 (134) 52	5.6 (54.4) 90	1.7 (15.5) 89	*	(65.3) 99	*	3.0 (8.6) 65	4.1 (72.3) 94	78.5 (398)	80
Σ reduction															
11-4-80	2163	66.6 (106)	3.5 (27.5)	*	*	70.1 (142) 50	8.9 (41.9) 79	1.9 (12.1) 84	*	(48.5) 99	*	4.4 (11.4) 61	3.0 (55.7) 95	88.3 (341)	74
Σ reduction															
Average halogenated organics influent level during test period															(348)

*Halogenated organics concentration <0.5 ppb.

- 1 = Chloroform (CHCl₃)
 2 = Dichlorobromomethane (CHCl₂Br)
 3 = Chlorodibromomethane (CHClBr₂)
 4 = Bromoform (CHBr₃)
 5 = 1,1,1-Trichloroethane (Cl₃C:CH₃)
 6 = Carbon Tetrachloride (CCl₄)
 7 = Trichloroethylene (Cl₃C:CHCl)
 8 = Tetrachloroethylene (Cl₂C:CCl₂)
 9 = p-Dichlorobenzene (C₆H₄Cl₂)
 10 = Hexachlorobenzene (C₆Cl₆)
 11 = Chlodane (Technical grade, 60%)

TABLE A6. ORGANIC CHEMICAL DATA

Unit: Aquacell Bacteriostatic, Run Number 3MW3 Spiked New Orleans Tap Water Test at 0.85 gpm Flow Rate															
Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)											Percent reduction halogenated organics		
		1	2	3	4	Total	5	6	7	8	9	10		11	total
9-26-80	29	1.8 (114)	* (23.4)	* (7.6)	* (*)	1.8 (145) 99	* (50.1) 99	* (13.9) 99	* (47.9) 99	* (41.2) 99	* (9.6) 99	* (4.9) 99	* (20.4) 99	1.8 (333)	99
X reduction															
10-7-80	604	3.8 (108)	* (15.6)	* (4.9)	* (*)	3.8 (128) 97	* (56.2) 99	* (14.3) 99	* (52.2) 99	* (28.6) 99	* (7.1) 99	* (3.5) 99	* (27.2) 99	3.8 (318)	99
X reduction															
10-13-80	1053	7.9 (115)	* (20.5)	* (5.3)	* (*)	7.9 (141) 94	* (57.5) 99	* (14.5) 99	* (67.4) 99	* (34.3) 99	2.8 (10.8) 74	0.6 (4.6) 87	1.9 (26.4) 93	13.2 (357)	96
X reduction															
10-20-80	1592	71.3 (116)	3.5 (15.3)	0.6 (3.3)	* (*)	75.4 (135) 44	9.5 (60.6) 84	3.6 (15.7) 77	3.9 (67.1) 94	2.0 (38.5) 95	* (8.2) 99	3.7 (6.1) 39	3.2 (40.3) 92	101 (372)	73
X reduction															
10-24-80	1968	97 (117)	5.2 (16.6)	0.7 (2.9)	* (*)	102.9 (137) 25	8.6 (53.7) 84	3.2 (15.4) 79	6.6 (61.5) 89	2.4 (36.6) 93	0.7 (10.3) 93	2.2 (7.5) 71	10.1 (57.8) 82	137 (379)	64
Average halogenated organics influent level during test period															(362)

*Halogenated organics concentration <0.5 ppb.

- 1 = Chloroform (CHCl₃)
 2 = Dichlorobromomethane (CHCl₂Br)
 3 = Chlorodibromomethane (CHClBr₂)
 4 = Bromoform (CHBr₃)
 5 = 1,1,1-Trichloroethane (Cl₃C:CH₃)
 6 = Carbon Tetrachloride (CCl₄)

- 7 = Trichloroethylene (Cl₃C:CHCl)
 8 = Tetrachloroethylene (Cl₄C:CCl₂)
 9 = p-Dichlorobenzene (C₆H₄Cl₂)
 10 = Hexachlorobenzene (C₆Cl₆)
 11 = Chlodane (Technical grade, 60%)

TABLE A7. ORGANIC CHEMICAL DATA

Unit: Aquacell Bacteriostatic, Run Number 3044
Spiked New Orleans Tap Water Test at 0.85 gpm Flow Rate

Test date	Gallons processed	1	2	3	4	5	6	7	8	9	10	11	total	Percent reduction halogenated organics
9-26-80	31	*	*	*	*	*	*	*	*	*	*	*	*	
% reduction		(114)	(23.4)	(7.6)	(*)	(145)	(50.1)	(13.9)	(47.9)	(41.2)	(9.6)	(20.4)	(333)	99
10-7-80	645	4.2	(15.6)	(4.9)	(*)	4.2	(56.2)	(14.3)	(28.6)	(7.1)	(3.5)	1.2	5.4	98
		(108)			(*)	(129)	(97)	(99)	(99)	(99)	(99)	(96)	(318)	
10-13-80	1087	12.9	*	*	*	12.9	(57.5)	(14.5)	(67.4)	0.5	0.8	2.3	16.5	95
% reduction		(115)	(20.5)	(5.3)	(*)	(141)	(99)	(99)	(99)	(10.8)	(4.6)	(26.4)	(357)	
10-20-80	1637	73.1	3.5	0.6	*	77.2	9.2	3.6	3.9	2.0	*	3.4	103	72
% reduction		(116)	(15.3)	(3.3)	(*)	(135)	(60.6)	(15.7)	(67.1)	(38.5)	(8.2)	(40.3)	(372)	
						43	85	77	94	95	34	99		
10-23-80	2004	104	5.6	0.8	*	110.4	10.5	3.4	5.5	1.8	1.0	5.0	138	63
		(117)	(16.6)	(3.7)	(*)	(137)	(52.1)	(15.0)	(59.7)	(35.0)	(7.7)	(60.9)	(378)	
					19	80	77	91	95	99	87	92		
Average halogenated organics influent level during test period														
*Halogenated organics concentration <0.5 ppb.														

1 = Chloroform (CHCl_3)
2 = Dichlorobromomethane (CHCl_2Br)
3 = Chlorodibromomethane (CHClBr_2)
4 = Bromoform (CHBr_3)
5 = 1,1,1-Trichloroethane ($\text{Cl}_3\text{C-CH}_3$)
6 = Carbon Tetrachloride (CCl_4)

7 = Trichloroethylene ($\text{Cl}_3\text{C-CHCl}$)
8 = Tetrachloroethylene ($\text{Cl}_2\text{C-CCl}_2$)
9 = p-Dichlorobenzene ($\text{C}_6\text{H}_4\text{Cl}_2$)
10 = Hexachlorobenzene (C_6Cl_6)
11 = Chlordane (Technical grade, 60%)

TABLE A8. ORGANIC CHEMICAL DATA

Unit: Continental, Model 350, Run Number 31J3 Spiked New Orleans Tap Water Test at 1 gpm Flow Rate															
Test date	Gallons processed	1	2	3	4	Total	Effluent (influent) halogenated organics (ppb)								Percent reduction halogenated organics
							5	6	7	8	9	10	11	total	
11-10-80	5	*	*	*	*	*	*	*	*	*	0.7	2.8	*	3.5	99
% reduction		(103)	(19.2)	(5.5)	(*)	(128)	(39.1)	(10.6)	(44.7)	(29.0)	(8.8)	(9.4)	(53.8)	(323)	
						99	99	99	99	99	92	70	99		
11-12-80	161	*	*	*	*	*	*	*	*	*	3.1	*	3.4	6.5	98
% reduction		(96.3)	(19.8)	(5.9)	(*)	(122)	(38.7)	(11.2)	(44.7)	(31.1)	(9.0)	(10.7)	(47.5)	(315)	
						99	99	99	99	99	66	99	93		
11-14-80	351	*	*	*	*	*	*	*	*	*	*	*	*	*	99
% reduction		(113)	(25.5)	(8.1)	(*)	(147)	(48.0)	(15.7)	(50.3)	(36.1)	(10.7)	(9.6)	(42.6)	(360)	
						99	99	99	99	99	99	99	99		
11-19-80	525	*	*	*	*	*	*	*	*	*	*	*	*	5.8	98
% reduction		(86.8)	(18.3)	(6.2)	(*)	(111)	(56.2)	(18.0)	(36.2)	(42.6)	(10.6)	(9.4)	(37.4)	(322)	
						99	99	99	99	99	99	99	99		
11-21-80	843	2.3	*	*	*	2.3	0.5	1.1	*	*	*	*	*	3.9	99
% reduction		(99.4)	(22.1)	(4.8)	(*)	(126)	(65.4)	(15.5)	(46.9)	(49.9)	(12.0)	(8.3)	(45.2)	(370)	
						98	99	93	99	99	99	99	99		
% reduction														(338)	

*Halogenated organics concentration <0.5 ppb.

- 1 = Chloroform (CHCl₃)
 2 = Dichlorobromomethane (CHCl₂Br)
 3 = Chlorodibromomethane (CHClBr₂)
 4 = Bromoform (CHBr₃)
 5 = 1,1,1-Trichloroethane (Cl₃CCH₃)
 6 = Carbon Tetrachloride (CCl₄)

- 7 = Trichloroethylene (Cl₃C:CHCl)
 8 = Tetrachloroethylene (Cl₄C:CCl₂)
 9 = p-Dichlorobenzene (C₆H₄Cl₂)
 10 = Hexachlorobenzene (C₆Cl₆)
 11 = Chlrodane (Technical grade, 60%)

TABLE A9. ORGANIC CHEMICAL DATA

Unit: Continental, Model 350, Run Number 3114 Spiked New Orleans Tap Water Test at 1 gpm Flow Rate															
Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)											Percent reduction halogenated organics		
		1	2	3	4	Total	5	6	7	8	9	10		11	total
11-10-80	6	*	*	*	*	*	*	*	*	*	*	*	*	*	99
% reduction		(103)	(19.2)	(5.5)	(*)	(128)	(39.1)	(10.6)	(44.7)	(29.0)	(8.8)	(9.4)	(53.8)	(323)	
11-12-80	177	*	*	*	*	*	*	*	*	*	*	*	*	*	99
% reduction		(96.3)	(19.8)	(5.9)	(*)	(122)	(38.7)	(11.2)	(44.7)	(31.1)	(9.0)	(10.7)	(47.5)	(315)	
11-14-80	372	*	*	*	*	*	*	*	*	*	*	*	*	*	99
% reduction		(113)	(25.5)	(8.1)	(*)	(147)	(48.0)	(15.7)	(50.3)	(36.1)	(10.7)	(9.6)	(42.6)	(360)	
11-19-80	558	*	*	*	*	*	*	*	*	*	*	*	*	*	99
% reduction		(86.8)	(18.3)	(6.2)	(*)	(111)	(56.2)	(18.0)	(36.2)	(42.6)	(10.6)	(9.4)	(37.4)	(322)	
11-21-80	751	0.5	*	*	*	0.5	1.0	1.0	*	*	*	1.3	*	1.8	99
% reduction		(99.4)	(22.1)	(4.8)	(*)	(126)	(65.4)	(15.5)	(46.9)	(49.9)	(12.0)	(8.3)	(45.2)	(370)	
Average halogenated organics influent level during test period															
(338)															

*Halogenated organics concentration <0.5 ppb.

- 1 = Chloroform (CHCl₃)
 2 = Dichlorobromomethane (CHCl₂Br)
 3 = Chlorodibromomethane (CHClBr₂)
 4 = Bromoform (CHBr₃)
 5 = 1,1,1-Trichloroethane (Cl₃C:CH₃)
 6 = Carbon Tetrachloride (CCl₄)
 7 = Trichloroethylene (Cl₃C:CHCl)
 8 = Tetrachloroethylene (Cl₂C:CCl₂)
 9 = p-Dichlorobenzene (C₆H₄Cl₂)
 10 = Hexachlorobenzene (C₆Cl₆)
 11 = Chlodane (Technical grade, 60%)

TABLE A10. ORGANIC CHEMICAL DATA

Unit: Culligan, Model SG-2, Run Number 3CD3
Spiked New Orleans Tap Water Test at 1.0 gpm Flow Rate

Test date	Gallons processed	1	2	3	4	Total	5	6	7	8	9	10	11	total	Percent reduction halogenated organics
9-26-80	29	* (114)	* (23.4)	* (7.6)	* (*)	* (145) 99	* (50.1) 99	* (13.9) 99	* (47.9) 99	* (41.2) 99	1.9 (9.6) 80	* (4.9) 99	* (20.4) 99	* (333)	99
% reduction															
10-13-80	1134	16.6 (115)	1.1 (20.5)	* (5.3)	* (*)	17.7 (141) 87	3.5 (57.5) 94	1.2 (14.5) 92	4.4 (67.4) 93	1.9 (34.3) 94	1.8 (10.8) 83	2.3 (4.6) 50	4.6 (26.4) 83	37.4 (357)	90
% reduction															
10-21-80	2065	106 (118)	9.0 (16.0)	1.8 (3.7)	* (*)	116.8 (138) 15	29.4 (54.2) 46	8.9 (14.9) 40	24.5 (61.5) 60	15.3 (36.4) 58	* (9.1) 99	0.9 (8.1) 89	2.3 (51.6) 96	198 (374)	47
% reduction															
11-5-80	3115	110 (112)	12.9 (25.5)	3.1 (7.7)	* (*)	126 (145) 13	25.1 (41.1) 39	8.4 (12.3) 32	22.3 (48.5) 54	14.5 (32.2) 55	0.7 (8.3) 92	6.2 (8.2) 24	10.5 (53.8) 80	214 (349)	39
% reduction															
11-13-80	4041	85.5 (100)	7.3 (26.2)	1.5 (5.9)	* (*)	94.3 (132) 29	10.9 (45.4) 76	4.0 (13.0) 69	9.3 (48.5) 81	5.3 (33.6) 84	0.7 (9.3) 92	3.3 (6.3) 48	4.6 (39.4) 88	132 (327)	60
% reduction															
Average halogenated organics influent level during test period															
(331)															

*Halogenated organics concentration <0.5 ppb.

1 = Chloroform (CHCl₃)2 = Dichlorobromomethane (CHCl₂Br)3 = Chlorodibromomethane (CHClBr₂)4 = Bromoform (CHBr₃)5 = 1,1,1-trichloroethane (Cl₃C:CH₃)6 = Carbon Tetrachloride (CCl₄)7 = Trichloroethylene (Cl₃C:CHCl)8 = Tetrachloroethylene (Cl₂C:CCl₂)9 = p-Dichlorobenzene (C₆H₄Cl₂)10 = Hexachlorobenzene (C₆Cl₆)

11 = Chlordane (Technical grade, 60%)

TABLE A11. ORGANIC CHEMICAL DATA

Unit: Culligan, Model SG-2, Run Number 3CD4
Spiked New Orleans Tap Water Test at 1.0 gpm Flow Rate

Test date	Gallons processed	1	2	3	4	5	6	7	8	9	10	11	total	Percent reduction halogenated organics
9-26-80	32	4.6 (114)	4.6 (23.4)	4.6 (7.6)	4.6 (*)	4.6 (145)	4.6 (13.9)	1.4 (47.9)	1.4 (41.2)	2.5 (9.6)	2.5 (4.9)	1.9 (20.4)	10.4 (333)	97
10-13-80	997	12.0 (115)	0.7 (20.5)	0.7 (5.3)	0.7 (*)	12.7 (141)	1.0 (14.5)	3.5 (67.4)	2.1 (34.3)	1.9 (10.8)	1.9 (4.6)	2.5 (26.4)	27.2 (357)	92
10-21-80	1952	100 (118)	4.9 (16.0)	0.7 (3.7)	0.7 (*)	105.6 (138)	3.7 (14.9)	9.3 (61.5)	4.8 (36.4)	3.7 (9.1)	3.7 (8.1)	5.9 (51.6)	143 (374)	62
11-5-80	3013	94.7 (112)	8.5 (25.5)	1.2 (7.7)	1.2 (*)	104.4 (145)	3.5 (12.3)	10.4 (48.5)	4.3 (32.2)	2.3 (8.3)	11.6 (8.2)	28.4 (53.8)	173 (349)	50
11-13-80	3847	109 (100)	8.3 (26.2)	1.4 (5.9)	1.4 (*)	118.7 (132)	12.8 (45.4)	8.8 (48.5)	4.7 (33.6)	1.0 (9.3)	3.4 (6.3)	5.9 (39.4)	159 (327)	51
Average halogenated organics influent level during test period														
*Halogenated organics concentration <0.5 ppb.														
1 = Chloroform (CHCl ₃)														
2 = Dichlorobromomethane (CHCl ₂ Br)														
3 = Chlorodibromomethane (CHClBr ₂)														
4 = Bromoform (CHBr ₃)														
5 = 1,1,1-Trichloroethane (Cl ₃ C:CH ₃)														
6 = Carbon Tetrachloride (CCl ₄)														
7 = Trichloroethylene (Cl ₃ C:CHCl)														
8 = Tetrachloroethylene (Cl ₄ C:CCl ₂)														
9 = p-Dichlorobenzene (Cl ₂ H ₄ :Cl ₂)														
10 = Hexachlorobenzene (C ₆ HCl ₆)														
11 = Chlodane (Technical grade, 60%)														

TABLE A12. ORGANIC CHEMICAL DATA

Unit: Everpure, Run Number 3GG3 Spiked New Orleans Tap Water Test at 0.60 gpm Flow Rate															
Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)											Percent reduction halogenated organics		
		1	2	3	4	Total	5	6	7	8	9	10		11	total
10-29-80	10	*	*	*	*	*	*	*	*	*	*	*	*	*	99
% reduction		(111)	(12.8)	(2.6)	(*)	(126)	(55.3)	(15.4)	(63.4)	(38.3)	(9.9)	(12.4)	(59.9)	(381)	
11-4-80	286	*	*	*	*	*	*	*	*	*	*	*	*	*	99
% reduction		(106)	(27.5)	(8.1)	(*)	(142)	(41.9)	(12.1)	(48.5)	(31.2)	(8.3)	(11.4)	(55.7)	(351)	
11-14-80	514	*	*	*	*	*	*	*	*	*	*	*	*	*	99
% reduction		(113)	(25.5)	(8.1)	(*)	(147)	(48.0)	(15.7)	(50.3)	(36.1)	(10.7)	(9.6)	(42.6)	(360)	
11-21-80	603	7.8	*	*	*	7.8	2.6	1.0	*	*	*	*	*	11	97
% reduction		(99.4)	(22.1)	(4.8)	(*)	(126)	(65.4)	(15.5)	(46.9)	(49.9)	(12.0)	(8.3)	(45.2)	(370)	
Average halogenated organics influent level during test period															
(344)															
UNIT PLUGGED PREMATURELY															

UNIT PLUGGED PREMATURELY

*Halogenated organics concentration <0.5 ppb.

- 1 = Chloroform (CHCl₃)
 2 = Dichlorobromomethane (CHCl₂Br)
 3 = Chlorodibromomethane (CHClBr₂)
 4 = Bromoform (CHBr₃)
 5 = 1,1,1-Trichloroethane (Cl₃C:CH₃)
 6 = Carbon Tetrachloride (CCl₄)
 7 = Trichloroethylene (Cl₃C:CHCl)
 8 = Tetrachloroethylene (Cl₂C:CCl₂)
 9 = p-Dichlorobenzene (C₆H₄Cl₂)
 10 = Hexachlorobenzene (C₆Cl₆)
 11 = Chloroethane (Technical grade, 60%)

TABLE A13. ORGANIC CHEMICAL DATA

Unit: Everpure, Run Number 3GG4 Spiked New Orleans Tap Water Test at 0.60 gpm Flow Rate															
Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)													
		1	2	3	4	Total	5	6	7	8	9	10	11	total	Percent reduction halogenated organics
11-12-80	9	*	*	*	*	*	*	*	*	*	*	*	*	*	
Σ reduction		(96.3)	(19.8)	(5.9)	(*)	(122)	(38.7)	(11.2)	(44.7)	(31.1)	(9.0)	(10.7)	(47.5)	(315)	99
11-18-80	231	*	*	*	*	*	*	*	*	*	*	*	*	*	
Σ reduction		(107)	(17.7)	(5.5)	(*)	(130)	(45.9)	(18.0)	(49.9)	(44.6)	(10.5)	(9.4)	(37.6)	(346)	99
11-21-80	339	*	*	*	*	*	*	*	*	*	*	*	*	*	
Σ reduction		(99.4)	(22.1)	(4.8)	(*)	(126)	(65.4)	(15.5)	(46.9)	(49.9)	(12.0)	(8.3)	(45.2)	(370)	99
Average halogenated organics influent level during test period															

*Halogenated organics concentration <0.5 ppb.

- 1 = Chloroform (CHCl₃)
 2 = Dichlorobromomethane (CHCl₂Br)
 3 = Chlorodibromomethane (CHClBr₂)
 4 = Bromoform (CHBr₃)
 5 = 1,1,1-Trichloroethane (Cl₃C:CH₃)
 6 = Carbon Tetrachloride (CCl₄)

- 7 = Trichloroethylene (Cl₃C:CHCl)
 8 = Tetrachloroethylene (Cl₂C:CCl₂)
 9 = p-Dichlorobenzene (C₆H₄Cl₂)
 10 = Hexachlorobenzene (C₆Cl₆)
 11 = Chlordane (Technical grade, 60%)

TABLE A14. ORGANIC CHEMICAL DATA

Unit: Seagull IV, Run Number 3XX3 Spiked New Orleans Tap Water Test at 0.80 gpm Flow Rate														
Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)											Percent reduction halogenated organics	
		1	2	3	4	Total	5	6	7	8	9	10		11
10-23-80	31	*	*	*	*	*	*	*	*	*	*	*	*	*
% reduction		(117)	(16.6)	(3.7)	(*)	(137)	(52.1)	(15.0)	(59.7)	(35.0)	(10.7)	(7.7)	(60.9)	(378)
						99	99	99	99	99	99	99	99	
10-29-80	355	31.3	*	*	*	31.3	*	*	*	*	*	*	*	31.3
% reduction		(111)	(12.8)	(2.6)	(*)	(126)	(55.3)	(15.4)	(63.4)	(38.3)	(9.9)	(12.4)	(59.9)	(380)
						75	99	99	99	99	99	99	99	
11-10-80	543	59.3	1.2	*	*	60.5	0.8	0.8	*	*	*	*	1.4	63.5
% reduction		(103)	(19.2)	(5.5)	(*)	(128)	(39.1)	(10.6)	(44.7)	(29.0)	(8.8)	(9.4)	(53.8)	(323)
						53	98	92	99	99	99	99	97	
Average halogenated organics influent level during test period														
(356)														
UNIT PLUGGED PREMATURELY														

- 1 = Chloroform (CHCl₃)
 2 = Dichlorobromomethane (CHCl₂Br)
 3 = Chlorodibromomethane (CHClBr₂)
 4 = Bromoform (CHBr₃)
 5 = 1,1,1-Trichloroethane (Cl₃C:CH₃)
 6 = Carbon Tetrachloride (CCl₄)
 7 = Trichloroethylene (Cl₃C:CHCl)
 8 = Tetrachloroethylene (Cl₂C:CCl₂)
 9 = p-Dichlorobenzene (C₆H₄Cl₂)
 10 = Hexachlorobenzene (C₆Cl₆)
 11 = Chlordane (Technical grade, 60%)

TABLE A15. ORGANIC CHEMICAL DATA

Unit: Seagull IV, Run Number 3XX4
Spiked New Orleans Tap Water Test at 0.80 gpm Flow Rate

Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)											Percent reduction halogenated organics	
		1	2	3	4	Total	5	6	7	8	9	10		11
10-23-80	31	*	*	*	*	*	*	*	*	*	*	*	*	*
% reduction		(117)	(16.6)	(3.7)	(*)	(137)	(52.1)	(15.0)	(59.7)	(35.0)	(10.7)	(7.7)	(60.9)	(378)
						99	99	99	99	99	99	99	99	99
10-29-80	377	48.8	*	*	*	48.8	*	*	*	*	0.6	*	*	49.4
% reduction		(111)	(12.8)	(2.6)	(*)	(126)	(55.3)	(15.4)	(63.4)	(38.3)	(9.9)	(12.4)	(59.9)	(380)
						61	99	99	99	99	94	99	99	87
11-10-80	585	91.7	*	*	*	91.7	0.5	*	*	*	*	*	*	92.2
% reduction		(103)	(19.2)	(5.5)	(*)	(128)	(39.1)	(10.6)	(44.7)	(29.0)	(8.8)	(9.4)	(53.8)	(323)
						28	99	99	99	99	99	99	99	71
Average halogenated organics influent level during test period														
(356)														

UNIT PLUGGED PREMATURELY

*Halogenated organics concentration <0.5 ppb.

- 1 = Chloroform (CHCl₃)
 2 = Dichlorobromomethane (CHCl₂Br)
 3 = Chlorodibromomethane (CHClBr₂)
 4 = Bromoform (CHBr₃)
 5 = 1,1,1-Trichloroethane (Cl₃C:CH₃)
 6 = Carbon Tetrachloride (CCl₄)
 7 = Trichloroethylene (Cl₃C:CHCl)
 8 = Tetrachloroethylene (Cl₂C:CCl₂)
 9 = p-Dichlorobenzene (C₆H₄Cl₂)
 10 = Hexachlorobenzene (C₆Cl₆)
 11 = Chlodane (Technical grade, 60%)

TABLE A16. ORGANIC CHEMICAL DATA

Unit: Hurley Town and Country, Run Number 3HH3 Spiked New Orleans Tap Water Test at 0.78 gpm Flow Rate															
Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)											Percent reduction halogenated organics		
		1	2	3	4	Total	5	6	7	8	9	10		11	total
10-6-80	6	0.7 (108)	* (17.6)	* (4.9)	* (*)	0.7 (130)	* (56.1)	* (14.3)	* (56.6)	* (28.8)	* (8.6)	* (3.8)	* (26.4)	0.7 (326)	99
% reduction						99	99	99	99	99	99	99	99	99	
10-20-80	993	37.4 (116)	* (15.3)	0.5 (3.3)	* (*)	37.9 (135)	7.6 (60.6)	2.4 (15.7)	0.9 (67.1)	* (38.5)	0.6 (8.2)	4.7 (6.1)	5.0 (40.3)	59.1 (372)	84
% reduction						72	87	85	99	99	93	23	88		
10-29-80	1993	101 (111)	6.8 (12.8)	1.1 (2.6)	* (*)	108.9 (126)	21.5 (55.3)	4.5 (15.4)	3.0 (63.4)	3.3 (38.3)	1.8 (9.9)	4.9 (12.4)	4.6 (59.9)	153 (380)	60
% reduction						14	61	71	95	91	82	60	92		
11-2-80	2934	99 (114)	9.0 (23.0)	1.7 (5.9)	* (*)	109.7 (143)	14.3 (48.0)	2.9 (13.5)	1.8 (55.9)	* (33.7)	1.6 (9.5)	5.7 (11.3)	8.6 (40.3)	145 (355)	59
% reduction						23	70	79	97	99	83	50	79		
11-21-80	4075	111 (99.4)	10.8 (22.1)	2.0 (4.8)	* (*)	123.8 (126)	20.3 (65.4)	3.6 (15.5)	2.4 (46.9)	* (49.9)	3.0 (12.0)	3.9 (8.3)	10.2 (45.2)	167 (370)	55
% reduction						2	69	77	95	99	75	53	77		
Average halogenated organics influent level during test period															(346)

*Halogenated organics concentration <0.5 ppb.

- 1 = Chloroform (CHCl₃)
 2 = Dichlorobromomethane (CHCl₂Br)
 3 = Chlorodibromomethane (CHClBr₂)
 4 = Bromoform (CHBr₃)
 5 = 1,1,1-Trichloroethane (Cl₃C-CH₃)
 6 = Carbon Tetrachloride (CCl₄)
 7 = Trichloroethylene (Cl₃C-CHCl)
 8 = Tetrachloroethylene (Cl₄C-CCl₂)
 9 = p-Dichlorobenzene (C₆H₄Cl₂)
 10 = Hexachlorobenzene (C₆Cl₆)
 11 = Chlrodane (Technical grade, 60%)

TABLE A17. ORGANIC CHEMICAL DATA

Unit: Hurley Town and Country, Run Number 3HH4
Spiked New Orleans Tap Water Test at 0.78 gpm Flow Rate

Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)											Percent reduction halogenated organics		
		1	2	3	4	Total	5	6	7	8	9	10		11	total
9-26-80	15	1.8 (114)	1.8 (23.4)	1.8 (7.6)	1.8 (*)	1.8 (145)	1.8 (50.1)	1.8 (13.9)	1.8 (47.9)	1.8 (41.2)	1.8 (9.6)	1.8 (20.4)	1.8 (333)	99	
Σ reduction															
10-15-80	988	70.7 (120)	5.8 (15.3)	1.2 (3.7)	1.2 (*)	77.7 (139)	21.4 (61.7)	3.9 (15.6)	4.2 (67.1)	5.4 (37.4)	3.6 (9.9)	3.8 (10.8)	10.2 (53.7)	130 (394)	67
Σ reduction															
10-24-80	2056	123 (117)	12.4 (16.6)	2.4 (2.9)	1.2 (*)	137.8 (136)	38.3 (53.7)	9.7 (15.4)	12.5 (61.5)	18.0 (36.6)	3.0 (10.3)	4.1 (7.5)	18.1 (57.8)	242 (379)	36
Σ reduction															
11-5-80	3033	107 (112)	15.0 (25.5)	3.9 (7.7)	1.2 (*)	125.9 (145)	27.3 (41.1)	6.9 (12.3)	5.3 (48.5)	9.6 (32.2)	3.0 (8.3)	6.0 (8.2)	12.9 (53.8)	197 (349)	44
Σ reduction															
11-18-80	4009	87.5 (107)	10.4 (17.7)	2.5 (5.5)	1.2 (*)	100.4 (130)	20.5 (45.9)	4.0 (18.0)	3.9 (49.8)	4.2 (44.6)	1.8 (10.5)	4.5 (9.4)	7.0 (37.6)	146 (346)	58
Σ recovery															
Average halogenated organics influent level during test period															
Σ Halogenated organics concentration <0.5 ppb.															
1 = Chloroform (CHCl ₃)															
2 = Dichlorobromomethane (CHCl ₂ Br)															
3 = Chlorodibromomethane (CHClBr ₂)															
4 = Bromoform (CHBr ₃)															
5 = 1,1,1-Trichloroethane (Cl ₃ C:CH ₃)															
6 = Carbon Tetrachloride (CCl ₄)															
7 = Trichloroethylene (Cl ₃ C:CHCl)															
8 = Tetrachloroethylene (Cl ₂ C:CCl ₂)															
9 = p-Dichlorobenzene (C ₆ H ₄ Cl ₂)															
10 = Hexachlorobenzene (C ₆ Cl ₆)															
11 = Chlordane (Technical grade, 60%)															

7 = Trichloroethylene (Cl₃C:CHCl)
8 = Tetrachloroethylene (Cl₂C:CCl₂)
9 = p-Dichlorobenzene (C₆H₄Cl₂)
10 = Hexachlorobenzene (C₆Cl₆)
11 = Chlordane (Technical grade, 60%)

TABLE A18. ORGANIC CHEMICAL DATA

Unit: Water Washer, Model 1000, Run Number 3KK3
Spiked New Orleans Tap Water Test at 0.46 gpm Flow Rate

Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)											Percent reduction halogenated organics		
		1	2	3	4	Total	5	6	7	8	9	10		11	total
9-26-80	4	8.0 (114)	0.6 (23.4)	* (7.6)	* (*)	8.6 (145)	2.1 (50.1)	*	1.6 (42.9)	0.6 (41.2)	*	*	*	12.9 (333)	96
Z reduction						94	96	99	96	99	99	99	99	99	
10-7-80	244	36.8 (108)	3.7 (15.6)	0.8 (4.9)	* (*)	41.3 (128)	6.5 (56.2)	2.8 (14.3)	8.9 (52.2)	3.2 (28.6)	1.1 (7.1)	2.8 (3.5)	5.9 (27.2)	72.5 (318)	77
Z reduction						68	88	80	83	89	85	20	28		
10-13-80	483	45.9 (115)	5.1 (20.5)	1.0 (5.3)	* (*)	52 (141)	10.6 (57.5)	3.6 (14.5)	11.2 (67.4)	4.0 (34.3)	1.6 (10.8)	3.1 (4.6)	5.5 (26.4)	91.6 (357)	74
Z reduction						63	82	75	83	88	85	33	79		
10-20-80	770	119 (116)	14.1 (15.3)	3.1 (3.3)	* (*)	136.2 (135)	53.0 (60.6)	14.9 (15.7)	51.0 (67.1)	28.5 (38.5)	7.2 (8.2)	4.4 (6.1)	20.4 (40.3)	316 (372)	15
Z reduction						0	13	5	24	26	12	28	49		
10-27-80	1034	124 (114)	11.1 (16.6)	2.8 (3.3)	* (*)	137.9 (134)	39.6 (54.4)	15.5 (15.5)	37.4 (65.3)	15.3 (37.9)	4.2 (10.3)	4.9 (8.6)	23.6 (72.3)	298 (398)	25
Z reduction						3	27	0	43	60	59	43	67		
Average halogenated organics influent level during test period															
halogenated organics concentration <0.5 ppb.															
(364)															

1 = Chloroform (CHCl₃)2 = Dichlorobromomethane (CHCl₂Br)3 = Chlorodibromomethane (CHClBr₂)4 = Bromoform (CHBr₃)5 = 1,1,1-Trichloroethane (Cl₃C:CH₃)6 = Carbon Tetrachloride (CCl₄)7 = Trichloroethylene (Cl₃C:CHCl)8 = Tetrachloroethylene (Cl₂C:CCl₂)9 = p-Dichlorobenzene (C₆H₄Cl₂)10 = Hexachlorobenzene (C₆Cl₆)

11 = Chlordane (Technical grade, 60%)

TABLE A19. ORGANIC CHEMICAL DATA

Unit: Water Washer, Model 1000, Run Number 3KK4 Spiked New Orleans Tap Water Test at 0.46 gpm Flow Rate														
Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)											Percent reduction halogenated organics	
		1	2	3	4	Total	5	6	7	8	9	10		11
10-6-80	3	11.1 (108)	0.8 (17.6)	*	*	11.9 (130)	2.4 (56.1)	1.0 (14.3)	2.9 (56.6)	1.0 (28.8)	*	4.3 (38.8)	26.3 (326)	92
10-15-80	255	103 (120)	8.6 (15.3)	1.9 (3.7)	*	113.5 (139)	28.0 (61.7)	7.7 (15.6)	25.0 (67.1)	11.9 (37.4)	3.9 (9.9)	7.8 (10.8)	216 (394)	45
10-21-80	492	115 (118)	13.8 (16.0)	2.6 (3.7)	*	131.4 (138)	38.6 (54.2)	11.1 (14.9)	39.6 (61.5)	19.5 (36.4)	4.4 (9.1)	3.3 (8.1)	267 (374)	29
10-30-80	751	119 (107)	9.8 (12.8)	1.5 (2.2)	*	130.3 (122)	34.8 (49.1)	7.3 (13.6)	24.4 (55.9)	12.0 (35.8)	3.1 (9.5)	4.4 (13.8)	229 (360)	36
11-7-80	1004	119 (112)	17.2 (20.4)	4.2 (5.5)	*	140.4 (138)	0.5 (40.1)	*	5.0 (46.6)	2.4 (30.6)	1.8 (8.1)	7.0 (8.6)	172 (331)	48
Average halogenated organics influent level during test period														
(360)														
Halogenated organics concentration <0.5 ppb.														

*Halogenated organics concentration <0.5 ppb.

- 1 = Chloroform (CHCl₃)
 2 = Dichlorobromomethane (CHCl₂Br)
 3 = Chlorodibromomethane (CHClBr₂)
 4 = Bromoform (CHBr₃)
 5 = 1,1,1-Trichloroethane (Cl₃C-CH₃)
 6 = Carbon Tetrachloride (CCl₄)
 7 = Trichloroethylene (Cl₃C-CHCl)
 8 = Tetrachloroethylene (Cl₄C-CCl₂)
 9 = p-Dichlorobenzene (C₆H₄Cl₂)
 10 = Hexachlorobenzene (C₆Cl₆)
 11 = Chlodane (Technical Grade, 60%)

TABLE A20. ORGANIC CHEMICAL DATA

Unit: Filbrook, Run Number 3SS3 Spiked New Orleans Tap Water Test at 0.02 gpm Flow Rate															
Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)													Percent reduction halogenated organics
		1	2	3	4	Total	5	6	7	8	9	10	11	total	
9-26-80	1.9	4.7 (114)	* (23.4)	* (7.6)	* (*)	4.7 (145) 97	* (50.1) 99	* (13.9) 99	0.6 (47.9) 99	* (41.2) 99	* (9.6) 99	* (4.9) 99	1.2 (20.4) 94	6.5 (333)	98
Σ reduction															
10-7-80	116	14.8 (108)	1.6 (15.6)	* (4.9)	* (*)	16.4 (128) 87	2.9 (56.2) 95	1.0 (14.3) 93	4.0 (52.2) 92	1.5 (28.6) 95	0.4 (7.1) 94	4.6 (3.5) 0	11.4 (27.2) 58	42.2 (318)	87
Σ reduction															
10-13-80	278	38.4 (115)	5.0 (20.5)	1.2 (3.3)	* (*)	44.6 (141) 68	14.1 (57.5) 75	5.4 (14.5) 63	17.6 (67.4) 74	8.5 (34.3) 75	1.8 (10.8) 83	3.1 (4.6) 33	14.1 (26.4) 47	109 (356)	69
Σ reduction															
10-21-80	415	107 (118)	9.7 (16.0)	1.9 (3.7)	* (*)	119 (138) 14	29.8 (54.2) 45	8.9 (14.9) 40	23.4 (61.5) 61	11.2 (36.4) 69	1.7 (9.1) 81	4.2 (8.1) 48	22.2 (51.6) 57	220 (374)	41
Σ reduction															
10-27-80	532	91.3 (114)	9.2 (16.6)	1.7 (3.3)	* (*)	102.2 (134) 24	33.2 (54.4) 39	8.9 (15.5) 43	32.1 (65.3) 51	16.7 (37.9) 56	5.5 (10.3) 47	3.8 (8.6) 56	27.0 (72.3) 63	229 (398)	42
Σ reduction															(364)
Average halogenated organics influent level during test period															

*Halogenated organics concentration <0.5 ppb.

- 1 = Chloroform (CHCl₃)
 2 = Dichlorobromomethane (CHCl₂Br)
 3 = Chlorodibromomethane (CHClBr₂)
 4 = Bromoform (CHBr₃)
 5 = 1,1,1-Trichloroethane (Cl₃C:CH₃)
 6 = Carbon Tetrachloride (CCl₄)
 7 = Trichloroethylene (Cl₃C:CHCl)
 8 = Tetrachloroethylene (Cl₄C:CCl₂)
 9 = p-Dichlorobenzene (C₆H₄Cl₂)
 10 = Hexachlorobenzene (C₆Cl₆)
 11 = Chlodeane (Technical grade, 60%)

TABLE A21. ORGANIC CHEMICAL DATA

Unit: Filbrook, Run Number 3SS4
Spiked New Orleans Tap Water Test at 0.02 gpm Flow Rate

Test date	Gallons processed	1	2	3	4	Total	5	6	7	8	9	10	11	total	Percent reduction halogenated organics
9-26-80	1.5	8.0 (114)	0.8 (23.4)	*	*	8.8 (145)	*	13.9 (99)	2.5 (47.9)	0.8 (41.2)	*	*	1.9 (20.4)	14 (333)	96
Σ reduction															
10-7-80	120	24.2 (108)	2.5 (15.6)	0.6 (4.9)	*	27.3 (128)	15.5 (56.2)	2.2 (14.3)	6.7 (52.2)	2.8 (28.6)	*	*	1.9 (27.2)	56 (318)	82
Σ reduction															
10-13-80	274	34.2 (115)	4.4 (20.5)	1.0 (5.3)	*	39.6 (141)	16.8 (57.5)	4.5 (14.5)	14.4 (67.4)	6.9 (34.3)	4.1 (10.8)	4.9 (4.6)	12.3 (26.4)	104 (356)	71
Σ reduction															
10-21-80	361	117 (118)	11.4 (16.0)	2.3 (3.7)	*	130.7 (138)	36.0 (54.2)	11.0 (14.9)	32.6 (61.5)	17.0 (36.4)	3.0 (9.1)	4.4 (8.1)	29.4 (51.6)	264 (374)	29
Σ reduction															
10-27-80	493	105 (114)	10.1 (16.6)	2.2 (3.3)	*	117.3 (134)	37.0 (54.4)	9.2 (15.5)	29.2 (65.3)	15.4 (37.9)	2.9 (10.3)	5.6 (8.6)	26.3 (72.3)	243 (398)	39
Σ reduction															
Average halogenated organics influent level during test period															
*Halogenated organics concentration <0.5 ppb.															

- 1 = Chloroform (CHCl₃)
 2 = Dichlorobromomethane (CHCl₂Br)
 3 = Chlorodibromomethane (CHClBr₂)
 4 = Bromoform (CHBr₃)
 5 = 1,1,1-Trichloroethane (Cl₃C-CH₃)
 6 = Carbon Tetrachloride (CCl₄)
 7 = Trichloroethylene (Cl₃C-CHCl)
 8 = Tetrachloroethylene (Cl₂C-CCl₂)
 9 = p-Dichlorobenzene (C₆H₄Cl₂)
 10 = Hexachlorobenzene (C₆Cl₆)
 11 = Chlordane (Technical grade, 60%)

TABLE A22. ORGANIC CHEMICAL DATA

Unit: Sears Taste and Odor, Run Number 3CC3
Spiked New Orleans Tap Water Test at 2.0 gpm Flow Rate

Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)											Percent reduction halogenated organics		
		1	2	3	4	Total	5	6	7	8	9	10		11	total
11-4-80	20	26.4 (106)	2.5 (27.5)	0.6 (8.1)	* (*)	29.5 (142)	2.4 (41.9)	2.8 (12.1)	3.4 (48.5)	1.6 (31.2)	* (8.3)	4.3 (11.4)	3.0 (55.7)	47 (351)	87
% reduction						79	94	77	93	95	99	62	95		
11-7-80	674	104 (112)	13.4 (20.4)	3.5 (5.5)	* (*)	120.9 (158)	3.9 (40.1)	1.8 (11.5)	* (46.6)	1.1 (30.6)	* (8.1)	7.2 (8.6)	23.5 (47.5)	158 (331)	52
% reduction						12	90	84	99	96	99	16	51		
11-11-80	1597	95 (110)	15.8 (20.4)	4.4 (5.9)	* (*)	115 (136)	28.4 (39.4)	10.0 (11.1)	23.4 (48.9)	17.2 (28.9)	1.2 (7.8)	4.4 (8.9)	17.2 (47.5)	217 (329)	34
% reduction						15	28	10	52	40	85	51	64		
11-17-80	2338	88.1 (102)	11.4 (23.0)	2.8 (7.7)	* (*)	102.3 (133)	26.6 (60.0)	9.1 (18.1)	12.0 (63.4)	1.5 (46.6)	* (12.2)	2.4 (9.2)	11.1 (45.7)	165 (388)	57
% reduction						23	56	50	81	97	99	74	76		
11-20-80	3078	86.5 (99.6)	12.1 (17.3)	3.1 (5.3)	* (*)	101.7 (122)	44.8 (71.7)	13.4 (23.9)	4.4 (52.9)	11.3 (54.6)	1.2 (12.7)	5.9 (6.5)	13.2 (30.5)	196 (375)	48
% reduction						17	38	44	92	79	91	9	57		
Average halogenated organics influent level during test period															

1 = Chloroform (CHCl₃)2 = Dichlorobromomethane (CHCl₂Br)3 = Chlorodibromomethane (CHClBr₂)4 = Bromoform (CHBr₃)5 = 1,1,1-Trichloroethane (Cl₃C:CH₃)6 = Carbon Tetrachloride (CCl₄)7 = Trichloroethylene (Cl₃C:CHCl)8 = Tetrachloroethylene (Cl₄C:CCl₂)9 = p-Dichlorobenzene (C₆H₄Cl₂)10 = Hexachlorobenzene (C₆Cl₆)

11 = Chlodane (Technical grade, 60%)

TABLE A23. ORGANIC CHEMICAL DATA

Unit: Sears Taste and Odor, Run Number 3004
Spiked New Orleans Tap Water Test at 2.0 gpm Flow Rate

Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)											Percent reduction halogenated organics	
		1	2	3	4	Total	5	6	7	8	9	10		11
11-4-80	20	72.3 (106)	13.4 (27.5)	4.1 (8.1)	*	89.8 (142)	14.7 (41.9)	5.9 (12.1)	25.6 (48.5)	15.6 (31.2)	3.4 (8.3)	6.8 (11.4)	22.4 (55.7)	184 (351)
% reduction						36	65	51	47	50	59	40	60	48
11-7-80	510	97.1 (112)	11.7 (20.4)	3.0 (5.5)	*	111.8 (138)	*	*	*	0.8 (30.6)	0.8 (8.1)	8.0 (8.6)	26.7 (47.5)	148 (331)
% reduction						19	99	99	99	97	90	7	44	55
11-11-80	1224	93.3 (110)	11.7 (20.4)	3.4 (5.9)	*	108.4 (136)	18.3 (39.4)	7.0 (11.1)	20.7 (48.9)	14.5 (28.9)	5.6 (7.8)	7.1 (8.9)	27.2 (47.5)	209 (329)
% reduction						21	54	37	58	50	28	85	43	36
11-18-80	2100	--	--	--	--	--	--	--	--	--	2.9 (10.5)	4.3 (9.4)	15.6 (37.6)	-- (346)
% reduction							99	99		72	54	59		--
11-21-80	2861	78.2 (99.4)	8.8 (22.1)	2.1 (4.8)	*	89.1 (126)	20.7 (65.4)	5.4 (15.5)	2.8 (46.9)	3.2 (49.9)	2.3 (12.0)	4.8 (8.3)	18.1 (45.2)	146 (370)
% reduction						30	68	65	94	94	81	42	60	60
Average halogenated organics influent level during test period														
(337)														
*Halogenated organics concentration <0.5 ppb.														

1 = Chloroform (CHCl₃)
2 = Dichlorobromomethane (CHCl₂Br)
3 = Chlorodibromomethane (CHClBr₂)
4 = Bromoform (CHBr₃)
5 = 1,1,1-Trichloroethane (Cl₃C:CH₃)
6 = Carbon Tetrachloride (CCl₄)

7 = Trichloroethylene (Cl₃C:CHCl)
8 = Tetrachloroethylene (Cl₄C:CCl₂)
9 = p-Dichlorobenzene (C₆H₄Cl₂)
10 = Hexachlorobenzene (C₆Cl₆)
11 = Chlodane (Technical grade, 60%)

TABLE A24. ORGANIC CHEMICAL DATA

Unit: Aqua Cleer, Model H5, Run Number 30P1
Spiked New Orleans Tap Water Test at 3.5 gpd Production Rate

Test Date	Gallons processed	1	2	3	4	5	6	7	8	9	10	11	total	Percent reduction halogenated organics
9-12-80	10	*	*	*	*	*	*	*	*	*	*	*	*	99
% reduction		(114)	(23.4)	(7.6)	(*)	(145)	(50.1)	(13.9)	(47.9)	(41.2)	(8.3)	(43.7)	(360)	
						99	99	99	99	99	99	99		
10-9-80	102	*	*	*	*	*	*	*	*	*	*	*	*	99
% reduction		(120)	(18.6)	(5.4)	(*)	(144)	(63.2)	(15.6)	(56.4)	(29.1)	(8.9)	(31.0)	(355)	
						99	99	99	99	99	99	99		
10-22-80	147	0.7	*	*	*	0.7	*	*	*	*	*	*	*	99
% reduction		(110)	(14.7)	(2.9)	(*)	(128)	(52.1)	(14.2)	(76.4)	(31.5)	(8.4)	(37.2)	(355)	
						99	99	99	99	99	99	99		
11-11-80	217	*	*	*	*	*	*	*	*	*	*	*	*	99
% reduction		(110)	(20.4)	(5.9)	(*)	(136)	(39.4)	(11.1)	(48.9)	(28.9)	(8.9)	(47.5)	(328)	
						99	99	99	99	99	99	99		
11-18-80	242	*	*	*	*	*	*	*	*	*	*	*	*	99
% reduction		(107)	(17.7)	(5.5)	(*)	(130)	(45.9)	(18.0)	(49.8)	(44.6)	(9.4)	(37.6)	(346)	
						99	99	99	99	99	99	99		
12-12-80	326	30.7	1.5	*	*	32.2	2.3	*	*	*	*	*	34.5	92
% reduction		(102)	(17.5)	(5.3)	(*)	(125)	(54.6)	(26.8)	(78.9)	(57.3)	(12.2)	(44.9)	(411)	
						74	96	99	99	99	99	99		
Average halogenated organics influent level during test period														(360)

*Halogenated organics concentration <0.5 ppb.

1 = Chloroform (CHCl₃)2 = Dichlorobromomethane (CHCl₂Br)3 = Chlorodibromomethane (CHClBr₂)4 = Bromoform (CHBr₃)5 = 1,1,1-Trichloroethane (Cl₃C-CH₃)6 = Carbon Tetrachloride (CCl₄)7 = Trichloroethylene (Cl₃C-CHCl)8 = Tetrachloroethylene (Cl₄C-CCl₂)9 = p-Dichlorobenzene (C₆H₄Cl₂)10 = Hexachlorobenzene (C₆Cl₆)

11 = Chlodane (Technical grade, 60%)

TABLE A25. ORGANIC CHEMICAL DATA

Unit: Aqua Cleer, Model H5, Run Number 30P2 Spiked New Orleans Tap Water Test at 5 god Production Rate												
Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)										
		1	2	3	4	Total	5	6	7	8	9	10
												11
												total
9-12-80	15	*	*	*	*	*	*	*	*	*	*	*
		(114)	(23.4)	(7.6)	(*)	(145)	(50.1)	(13.9)	(47.9)	(41.2)	(9.7)	(8.3)
						99	99	99	99	99	99	99
10-9-80	150	*	*	*	*	*	*	*	*	*	*	*
		(120)	(18.6)	(5.4)	(*)	(144)	(63.2)	(15.6)	(34.4)	(29.1)	(8.6)	(8.9)
						99	99	99	99	99	99	99
10-22-80	215	*	*	*	*	*	*	*	*	*	*	*
		(110)	(14.7)	(2.9)	(*)	(128)	(52.1)	(14.2)	(76.4)	(31.5)	(7.4)	(8.4)
						99	99	99	99	99	99	99
11-11-80	315	0.6	*	*	*	0.6	*	*	*	*	*	*
		(110)	(20.4)	(5.9)	(*)	(136)	(39.4)	(11.1)	(48.9)	(28.9)	(7.8)	(8.9)
						99	99	99	99	99	99	99
11-18-80	350	2.4	*	*	*	2.4	*	*	*	*	*	*
		(107)	(17.7)	(5.5)	(*)	(130)	(45.9)	(18.0)	(49.8)	(44.6)	(10.5)	(9.4)
						99	99	99	99	99	99	99
12-12-80	470	3.6	1.5	*	*	5.1	*	*	*	*	*	*
		(102)	(17.5)	(5.3)	(*)	(125)	(54.6)	(26.8)	(78.9)	(57.3)	(12.2)	(11.2)
						96	99	99	99	99	99	99
Average halogenated organics Influent level during test period												
(360)												

*Halogenated organics concentration <0.5 ppb.

1 = Chloroform (CHCl₃)2 = Dichlorobromomethane (CHCl₂Br)3 = Chlorodibromomethane (CHClBr₂)4 = Bromoform (CHBr₃)5 = 1,1,1-Trichloroethane (Cl₃CCl₃)6 = Carbon Tetrachloride (CCl₄)7 = Trichloroethylene (Cl₃C:CHCl)8 = Tetrachloroethylene (Cl₄C:CCl₂)9 = p-Dichlorobenzene (C₆H₄Cl₂)10 = Hexachlorobenzene (C₆Cl₆)

11 = Chloroform (Technical grade, 60%)

TABLE A26. ORGANIC CHEMICAL DATA

Unit: Water Purification Systems Inc., Model WPSI-UTC-5, Run Number 3QR1
Spiked New Orleans Tap Water Test at 1.6 gpd Production Rate

Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)											Percent reduction halogenated organics		
		1	2	3	4	Total	5	6	7	8	9	10		11	total
9-12-80	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Σ reduction		(114)	(23.4)	(7.6)	(*)	(145)	(50.1)	(13.9)	(47.9)	(41.2)	(9.7)	(8.3)	(43.7)	(360)	--
10-9-80	43	64.1	11.7	22.2	*	98	*	1.3	6.7	*	*	*	*	86	76
Σ reduction		(120)	(18.6)	(5.4)	(*)	(144)	(63.2)	(15.6)	(34.4)	(29.1)	(8.6)	(8.9)	(31.0)	(355)	
						32	99	92	81	99	99	99	99		
10-22-80	64	134	17.3	5.4	*	156.7	60.4	6.2	5.3	*	*	*	*	229	35
Σ reduction		(110)	(14.7)	(2.9)	(*)	(128)	(52.1)	(14.2)	(76.4)	(31.5)	(7.4)	(8.4)	(37.2)	(355)	
						~0	~0	56	93	99	99	99	99		
11-11-80	96	116	15.4	3.8	*	135.2	49.2	5.6	10.1	*	*	*	*	200	39
Σ reduction		(110)	(20.4)	(5.9)	(*)	(136)	(39.4)	(4.1)	(48.9)	(28.9)	(7.8)	(8.9)	(47.5)	(328)	
						0.8	~0	~0	79	99	99	99	99		
11-18-80	107	105	15.7	3.7	*	124.4	44.9	4.8	8.9	*	*	*	*	183	47
Σ reduction		(107)	(17.7)	(5.5)	(*)	(130)	(45.9)	(18.0)	(49.8)	(44.6)	(10.5)	(9.4)	(37.6)	(346)	
						4	2	73	82	99	99	99	99		
12-12-80	146	105.5	15.1	5.2	*	125	57.4	6.6	46.4	0.8	*	*	*	237	42
Σ reduction		(102)	(17.5)	(5.3)	(*)	(125)	(54.6)	(26.8)	(78.9)	(57.3)	(12.2)	(11.2)	(44.9)	(411)	
						0	~0	75	41	99	99	99	99		
Average halogenated organics Influent level during test period															
(360)															

*Halogenated organics concentration <0.5 ppb.

- 1 = Chloroform (CHCl₃)
 2 = Dichlorobromomethane (CHCl₂Br)
 3 = Chlorodibromomethane (CHClBr₂)
 4 = Bromoform (CHBr₃)
 5 = 1,1,1-Trichloroethane (Cl₃C:CH₃)
 6 = Carbon Tetrachloride (CCl₄)
 7 = Trichloroethylene (Cl₃C:CHCl)
 8 = Tetrachloroethylene (Cl₄C:CCl₂)
 9 = p-Dichlorobenzene (C₆H₄Cl₂)
 10 = Hexachlorobenzene (C₆Cl₆)
 11 = Chlodane (Technical grade, 60%)

TABLE A27. ORGANIC CHEMICAL DATA

Unit: Water Purification Systems Inc., Model WPSI-UTC-5, Run Number 30R2
Spiked New Orleans Tap Water Test at 1.6 gpd Production Rate

Test date	Gallons processed	1	2	3	4	Total	5	6	7	8	9	10	11	total	Percent reduction halogenated organics
10-9-80	43	66.2 (120)	7.6 (18.6)	0.6 (5.4)	*	74.4 (154) 52	*	(15.6)	*	(29.1)	*	(8.9)	*	74 (355)	79
% reduction															
10-22-80	64	145 (110)	21.9 (14.7)	5.2 (2.9)	*	172.1 (128) 0	49.7 (52.1) 5	4.3 (14.2) 70	3.7 (76.4) 95	*	*	(8.4)	*	230 (355)	35
% reduction															
11-11-80	96	116 (110)	16.3 (20.4)	3.9 (5.9)	*	136.2 (136.3) 0	47.7 (39.4) 0	5.8 (4.1) 0	5.6 (48.9) 86	*	*	(8.9)	*	195 (328)	41
% reduction															
11-18-80	107	97.8 (107)	15.9 (17.7)	3.5 (5.5)	*	117.2 (130) 10	41.0 (45.9) 11	5.5 (18.0) 69	5.6 (49.8) 89	*	*	(9.4)	*	173 (346)	50
% reduction															
12-12-80	146	97.1 (102)	15.5 (17.5)	5.0 (5.3)	*	117.6 (125) 6	47.4 (54.6) 13	8.0 (26.8) 70	37.3 (78.9) 53	*	*	(11.2)	*	210 (411)	49
% reduction															
Average halogenated organics influent level during test period															
(364)															

*Halogenated organics concentration <0.5 ppb.

- 1 = Chloroform (CHCl₃)
2 = Dichlorobromomethane (CHCl₂Br)
3 = Chlorodibromomethane (CHClBr₂)
4 = Bromoform (CHBr₃)
5 = 1,1,1-Trichloroethane (Cl₃C-CH₃)
6 = Carbon Tetrachloride (CCl₄)

- 7 = Trichloroethylene (Cl₃C-CHCl)
8 = Tetrachloroethylene (Cl₂C-CCl₂)
9 = p-Dichlorobenzene (C₆H₄Cl₂)
10 = Hexachlorobenzene (C₆Cl₆)
11 = Chlordane (Technical grade, 60%)

TABLE A28. ORGANIC CHEMICAL DATA

Unit: Ozomatic Water Purifier, Run Number 3WXL Spiked New Orleans Tap Water Test at 1.5 Gallon Per Batch Production Rate															
Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)										Percent reduction halogenated organics			
		1	2	3	4	Total	5	6	7	8	9		10	11	total
10-29-80	4	59.9 (111)	7.6 (12.8)	1.7 (2.6)	* (*)	69.2 (126) 45	23.0 (55.3) 58	1.2 (15.4) 92	11 (63.4) 83	1.1 (38.3) 92	4.4 (9.9) 56	6.4 (12.4) 48	23.7 (59.9) 60	140 (380)	63
% reduction															
11-4-80	28	43.9 (102)	11.7 (22.6)	4.3 (7.4)	* (*)	59.9 (132) 55	2.9 (42.4) 93	1.2 (12.7) 91	* (48.4) 99	* (27) 99	1.5 (5.8) 74	4.2 (8.1) 48	10.8 (33.0) 67	81 (309)	74
% reduction															
11-11-80	44	49.7 (110)	10.3 (20.4)	4.0 (5.9)	* (*)	64 (136) 53	18.8 (39.4) 52	1.0 (11.1) 91	3.4 (48.9) 93	* (28.9) 99	1.3 (7.8) 83	2.2 (8.9) 75	8.6 (47.5) 82	99 (328)	70
% reduction															
11-17-80	57	37.3 (102)	10.1 (23)	4.6 (7.7)	* (*)	52 (133) 61	3.1 (60) 95	1.2 (18.1) 93	* (63.4) 99	* (46.6) 99	3.6 (12.2) 70	6.8 (9.2) 26	17.2 (45.7) 62	84 (388)	78
% reduction															
12-2-80	80	47.0 (130)	9.0 (16.7)	3.0 (4.5)	* (*)	59 (151) 61	7.6 (54.6) 86	2.5 (23.4) 89	12.1 (68.4) 82	3.5 (51.3) 93	4.3 (9.5) 55	3.9 (6.2) 37	11.3 (24.2) 53	104 (389)	73
% reduction															
Average halogenated organics influent level during test period															
(352)															

Halogenated organics concentration <0.5 ppb.

- 1 = Chloroform (CHCl₃)
 2 = Dichlorobromomethane (CHCl₂Br)
 3 = Chlorodibromomethane (CHClBr₂)
 4 = Bromoform (CHBr₃)
 5 = 1,1,1-Trichloroethane (Cl₃C:CH₃)
 6 = Carbon Tetrachloride (CCl₄)
 7 = Trichloroethylene (Cl₃C:CHCl)
 8 = Tetrachloroethylene (Cl₄C:CCl₂)
 9 = p-Dichlorobenzene (C₆H₄Cl₂)
 10 = Hexachlorobenzene (C₆Cl₆)
 11 = Chlordane (Technical grade, 60%)

TABLE A29. ORGANIC CHEMICAL DATA

Unit: Ozomatic Water Purifier, Run Number 3WX2 Spiked New Orleans Tap Water Test at 1.5 Gallon Per Batch Production Rate															
Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)										Percent reduction halogenated organics			
		1	2	3	4	Total	5	6	7	8	9		10	11	total
10-29-80	4	72.7 (111)	8.7 (12.8)	2.0 (2.6)	*	83.4 (126)	22.5 (55.3)	1.4 (15.4)	15.8 (63.4)	3.5 (38.3)	4.9 (9.9)	4.7 (12.4)	23.0 (59.9)	159 (380)	58
% reduction						34	59	91	75	91	51	62	62		
11-4-80	28	58.1 (102)	14.2 (22.6)	4.8 (7.4)	*	77.1 (132)	6.0 (42.4)	1.7 (12.7)	2.4 (48.4)	* (27)	4.3 (5.8)	5.4 (8.1)	19.5 (33.0)	116 (309)	62
% reduction						42	86	87	95	99	26	33	41		
11-11-80	44	59.7 (110)	13.4 (20.4)	5.1 (5.9)	*	78.2 (136)	18.4 (39.4)	0.7 (11.1)	5.3 (48.9)	0.5 (28.9)	2.9 (7.8)	3.9 (8.9)	12.7 (47.5)	123 (328)	63
% reduction						43	53	94	90	98	63	56	74		
11-17-80	57	49 (102)	12.7 (23)	5.2 (7.7)	*	66.9 (133)	6.5 (60)	1.8 (18.1)	2.4 (63.4)	* (46.6)	3.8 (12.2)	6.5 (9.2)	17.2 (45.7)	105 (388)	73
% reduction						50	89	90	96	99	69	29	62		
12-2-80	80	62.3 (130)	11.1 (16.7)	3.8 (4.5)	*	77.2 (151)	11.8 (54.6)	3.1 (23.4)	16.0 (68.4)	6.3 (51.3)	6.4 (9.5)	5.8 (6.2)	16.1 (24.2)	143 (389)	63
% reduction						49	78	87	77	88	33	65	33		
Average halogenated organics influent level during test period															(352)

*Halogenated organics concentration <0.5 ppb.

- 1 = Chloroform (CHCl₃)
 2 = Dichlorobromomethane (CHCl₂Br)
 3 = Chlorodibromomethane (CHClBr₂)
 4 = Bromoform (CHBr₃)
 5 = 1,1,1-Trichloroethane (Cl₃C:CH₃)
 6 = Carbon Tetrachloride (CCl₄)

- 7 = Trichloroethylene (Cl₃C:CHCl)
 8 = Tetrachloroethylene (Cl₄C:CCl₂)
 9 = p-Dichlorobenzene (C₆H₄Cl₂)
 10 = Hexachlorobenzene (C₆Cl₆)
 11 = Chlodane (Technical grade, 60%)

TABLE A30. ORGANIC CHEMICAL DATA

Unit: Ultraviolet Water Conditioning System, Model CM5, Run Number 3Y21 Spiked New Orleans Tap Water Test at 0.67 gpm Flow Rate															
Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)											Percent reduction halogenated organics		
		1	2	3	4	Total	5	6	7	8	9	10		11	total
10-24-80	3	2.9 (117)	* (16.6)	* (2.9)	* (*)	2.9 (53.7) 98	1.5 (15.4) 97	* (61.5) 99	* (36.6) 96	* (10.3) 99	(7.5) 71	2.2 (57.8) 98	1.4 (379)	8	98
% reduction															
11-4-80	586	107 (102)	18.6 (22.6)	4.2 (7.4)	* (*)	129.8 (132) 2	45.8 (42.4) 0	12.0 (12.7) 6	20.8 (48.4) 57	2.2 (27) 92	2.4 (5.8) 59	5.5 (8.1) 32	7.0 (33) 79	226 (309)	27
% reduction															
11-11-80	1226	115 (110)	19.6 (20.4)	5.9 (5.9)	* (*)	140.5 (132) 43	40.7 (39.4) 0	10.3 (11.1) 7	19.6 (48.9) 60	5.0 (28.9) 83	* (7.8) 99	4.3 (8.9) 52	* (47.5) 99	220 (328)	33
% reduction															
11-18-80	1738	107 (107)	20.3 (17.7)	6.5 (5.5)	* (*)	133.8 (132) 0	55.3 (45.9) 0	15.0 (18) 17	25.5 (49.8) 49	14.8 (44.6) 67	1.1 (10.5) 90	5.6 (9.4) 40	2.8 (37.6) 93	254 (346)	27
% reduction															
12-4-80	2762	107.4 (129)	12.7 (12.5)	3.8 (3.2)	* (*)	123.9 (145) 15	60.8 (52.7) 0	19.8 (23.6) 16	61.4 (68.4) 10	31.3 (47.0) 33	0.8 (11.0) 93	* (8.7) 99	4.1 (34.6) 88	302 (391)	23
% reduction															
Average halogenated organics influent level during test period															(357)

*Halogenated organics concentration <0.5 ppb.

- 1 = Chloroform (CHCl₃)
 2 = Dichlorobromomethane (CHCl₂Br)
 3 = Chlorodibromomethane (CHClBr₂)
 4 = Bromoform (CHBr₃)
 5 = 1,1,1-trichloroethane (Cl₃C:CH₃)
 6 = Carbon Tetrachloride (CCl₄)

- 7 = Trichloroethylene (Cl₃C:CHCl)
 8 = Tetrachloroethylene (Cl₄C:CCl₂)
 9 = p-Dichlorobenzene (C₆H₄Cl₂)
 10 = Hexachlorobenzene (C₆Cl₆)
 11 = Chlodane (Technical Grade, 60%)

TABLE A31. ORGANIC CHEMICAL DATA

Unit: Ultraviolet Water Conditioning System, Model CW5, Run Number 3Y22 Spiked New Orleans Tap Water Test at 0.67 gpm Flow Rate															
Test date	Gallons processed	Effluent (influent) halogenated organics (ppb)											Percent reduction halogenated organics		
		1	2	3	4	Total	5	6	7	8	9	10		11	total
10-24-80	3	5.3 (117)	* (16.6)	* (2.9)	* (*)	5.3 (137) 96	2.3 (53.7) 96	* (15.4) 99	* (61.5) 99	* (36.6) 99	* (10.3) 99	2.1 (7.5) 72	1.4 (57.8) 98	11 (379)	97
% reduction															
11-4-80	586	10.7 (102)	19.6 (22.6)	4.8 (7.4)	* (*)	35.1 (132) 73	46.1 (42.4) 0	12.6 (12.7) 0.8	23.8 (48.4) 51	5.7 (27) 79	3.1 (5.8) 47	5.5 (8.1) 32	10.5 (33) 68	239	23
% reduction															
11-11-80	1226	108 (110)	19.0 (20.4)	5.6 (5.9)	* (*)	132.6 (136) 3	37.9 (39.4) 4	9.8 (11.1) 12	17.8 (48.9) 64	7.6 (28.9) 74	0.5 (7.8) 94	5.7 (8.9) 36	3.4 (47.5) 93	215 (328)	34
% reduction															
11-18-80	1738	104 (107)	20.3 (17.7)	6.9 (5.5)	* (*)	131.2 (130.2) 0	53.8 (45.9) 0	13.5 (18) 25	27.9 (49.8) 44	12.0 (44.6) 23	* (10.5) 99	* (9.4) 99	* (37.6) 99	238 (346)	31
% reduction															
12-4-80	2762	112.7 (129)	12.9 (12.5)	4.0 (3.2)	* (*)	129.6 (145) 11	64.9 (52.7) 23	19.9 (23.6) 16	59.6 (68.4) 13	27.9 (47.0) 41	1.4 (11) 87	* (8.7) 99	4.1 (34.6) 88	307 (391)	21
Average halogenated organics															(357)

*Halogenated organics concentration <0.5 ppb.

- 1 = Chloroform (CHCl₃)
 2 = Dichlorobromomethane (CHCl₂Br)
 3 = Chlorodibromomethane (CHClBr₂)
 4 = Bromoform (CHBr₃)
 5 = 1,1,1-Trichloroethane (Cl₃C:CH₃)
 6 = Carbon Tetrachloride (CCl₄)

- 7 = Trichloroethylene (Cl₃C:CHCl)
 8 = Tetrachloroethylene (Cl₄C:CCl₂)
 9 = p-Dichlorobenzene (C₆H₄Cl₂)
 10 = Hexachlorobenzene (C₆Cl₆)
 11 = Chlodane (Technical grade, 60%)

TABLE A32. NONPURGEABLE CARBON ADSORBABLE ORGANIC HALIDE (NPCAOX) DATA
FOR THE SURFACE WATER STUDY

Test Date	Gallons Processed	Effluent TOX (ppb)	Effluent NPCAOX (ppb)	Estimated* Influent NPCAOX (ppb)	Percent Reduction NPCAOX
Line Bypass Units					
Aquacell Bacteriostatic - Run Numbers 1 and 2					
09-26-80	29	10.4	8	131	94
10-07-80	604	72.6	58	131	56
10-13-80	1053	93.1	60	131	54
10-20-80	1592	178	108	131	18
10-23-80	1968	202	86	131	34
09-26-80	31	7.8	7	131	95
10-07-80	645	54.7	41	131	69
10-13-80	1087	101	66	131	50
10-20-80	1637	209	134	131	0
10-23-80	2004	239	132	131	0
Aqualux, Model CB-2					
Run Numbers 1 and 2					
09-26-80	14	6.4	4	131	97
10-10-80	469	115	68	131	48
10-17-80	1002	217	129	131	2
10-27-80	1529	285	152	198	23
11-04-80	2079	289	151	198	24
09-26-80	13	7.8	6	131	95
10-10-80	573	70.4	60	131	54
10-17-80	1000	119	92	131	30
10-27-80	1621	212	141	198	29
11-04-80	2163	231	173	198	13
Continental, Model 350					
Run Numbers 1 and 2					
11-10-80	5	47.8	47	182	74
11-12-80	161	9.6	9	182	95
11-14-80	351	38.3	34	182	81
11-19-80	525	--	--	--	--
11-20-80	655	--	--	--	--
11-10-80	6	33.5	33	182	82
11-12-80	177	11.8	9	182	95
11-14-80	372	19.6	19	182	90
11-19-80	558	--	--	--	--
11-20-80	655	--	--	--	--

(Continued)

TABLE A32. (Continued)

Test Date	Gallons Processed	Effluent TOX (ppb)	Effluent NPCAOX (ppb)	Estimated* Influent NPCAOX (ppb)	Percent Reduction NPCAOX
Culligan, Model SG-2					
Run Numbers 1 and 2					
09-26-80	29	8	5	131	96
10-13-80	1134	217	109	131	17
10-21-80	2065	297	164	131	0
11-05-80	3115	--	--	--	--
11-13-80	4041	216	104	182	43
09-26-80	32	32	10	131	92
10-13-80	997	120	70	131	47
10-21-80	1952	267	149	131	0
11-05-80	3013	--	--	--	--
11-13-80	3847	217	89	182	51
Everpure, Model QC4-THM					
Run Numbers 1 and 2					
10-29-80	10	23	16	198	92
11-04-80	286	67.8	66	198	67
11-14-80	514	55.1	53	182	71
11-20-80	600	41.1	36	125	71
11-12-80	9	21.8	9	182	95
11-18-80	231	26.4	23	125	82
11-20-80	320	--	--	--	--
Seagull IV					
Run Numbers 1 and 2					
10-23-80	31	173	23	198	88
10-29-80	355	130	55	198	72
11-10-80	543	170	83	182	54
10-23-80	31	--	--	--	--
10-29-80	377	--	--	--	--
11-10-80	585	239	133	182	38

TABLE A32. (Continued)

Test Date	Gallons Processed	Effluent TOX (ppb)	Effluent NPCAOX (ppb)	Estimated* Influent NPCAOX (ppb)	Percent Reduction NPCAOX
Faucet-Mount Units					
Hurley Town and Country, Run Numbers 1 and 2					
10-06-80	6	7.7	6	131	95
10-20-80	997	136	71	131	46
10-29-80	1993	255	135	198	32
11-12-80	2954	214	88	182	52
09-26-80	15	16	10	131	92
10-15-80	988	251	107	131	18
10-24-80	2056	312	131	198	34
11-06-80	3033	330	190	182	0
11-18-80	4009	274	103	125	18
Water Washer, Model 1000					
Run Numbers 1 and 2					
09-26-80	4	52.3	31	131	76
10-07-80	244	282	116	131	89
10-13-80	483	334	120	131	8
10-20-80	770	367	148	131	0
10-27-80	1034	378	166	198	16
10-06-80	3	68.3	30	131	77
10-15-80	255	302	138	131	0
10-21-80	492	357	148	131	0
10-30-80	751	296	129	198	35
11-07-80	1004	230	190	182	0
Pour-Through Unit, Filbrook					
Run Numbers 1 and 2					
09-26-80	2	50.2	27	131	79
10-07-80	116	185	95	131	27
10-13-80	278	262	125	131	5
10-21-80	415	264	148	131	0
10-27-80	532	309	163	198	18
09-26-80	2	53.9	31	131	76
10-07-80	120	165	100	131	24
10-13-80	274	255	131	131	0
10-21-80	361	273	142	131	0
10-27-80	493	272	140	198	29

TABLE A32. (Continued)

Test Date	Gallons Processed	Effluent TOX (ppb)	Effluent NPCAOX (ppb)	Estimated* Influent NPCAOX (ppb)	Percent Reduction NPCAOX
Stationary Unit					
Sears Taste and Odor, Run Numbers 1 and 2					
11-04-80	0	107	85	198	57
11-07-80	674	--	--	--	--
11-11-80	1597	296	133	182	27
11-17-80	2338	216	100	161	38
11-20-80	3078	229	92	125	26
11-04-80	0	124	71	198	64
11-07-80	510	--	--	--	--
11-11-80	1224	261	133	182	27
11-18-80	2100	107	52	125	58
11-20-80	2417	213	83	125	34

*Influent levels were estimated using a limited number of influent NPCAOX values during the testing period.

Influents		
Date	NPCAOX	TOX
09-11-80	85	337
09-11-80	115	376
10-22-80	193	415
11-05-80	202	451
11-17-80	161	410
11-19-80	98	340
11-20-80	115	406
Average	138	404

TABLE A33. NONPURGEABLE CARBON ADSORBABLE ORGANIC HALIDE (NPCAOX)
DATA FOR THE NONCARBON UNIT STUDY

Test Date	Gallons Processed	Effluent TOX (ppb)	Effluent NPCAOX (ppb)	Estimated* Influent NPCAOX (ppb)	Percent Reduction NPCAOX
Reverse Osmosis Units					
Aqua Clean, Model H5 - Run Numbers 1 and 2					
09-12-80	15	11	6	138	96
10-09-80	150	9	2	138	99
10-22-80	215	28	4	193	98
11-11-80	315	9	3	138	98
11-18-80	350	7	6	138	96
09-12-80	10	19	9	138	94
10-09-80	102	14	7	138	95
10-22-80	147	26	1	193	99
11-11-80	217	21	8	138	94
11-18-80	242	34	4	138	97
WPSI-UTC-5					
Run Numbers 1 and 2					
09-12-80	2	33	11	138	93
10-09-80	43	189	19	138	86
10-22-80	96	229	22	138	84
11-18-80	107	90	14	138	90
10-09-80	43	177	14	138	90
10-22-80	64	207	7	193	96
11-11-80	96	192	14	138	90
11-18-80	107	160	11	138	92
Ozomatic Water Purifier					
Run Numbers 1 and 2					
10-29-80	4	205	132	138	4
11-04-80	28	193	124	138	10
11-11-80	44	162	88	138	36
11-17-80	57	155	131	161	19
11-04-80	28	204	113	138	18
11-11-80	44	177	110	138	20
11-17-80	57	176	145	161	10

(continued)

TABLE A33 (continued).

Test Date	Gallons Processed	Effluent TOX (ppb)	Effluent NPCAOX (ppb)	Estimated* Influent NPCAOX (ppb)	Percent Reduction NPCAOX
Ultraviolet Water Conditioning System, Model CW-5					
Run Numbers 1 and 2					
11-04-80	586	356	133	138	4
11-11-80	1226	341	135	138	2
11-18-80	1738	338	134	138	3
11-04-80	586	349	135	138	2
11-11-80	1226	349	140	138	~0
11-18-80	1738	349	152	138	~0

*Influent levels were estimated using a limited number of influent NPCAOX values during the testing period.

Influents

Date	NPCAOX	TOX
09-11-80	85	337
09-11-80	115	376
10-22-80	193	415
11-05-80	202	451
11-17-80	161	410
11-19-80	98	340
11-20-80	115	406
Average	138	404

TABLE A34. SUPPLEMENTARY DATA FOR NONCARBON UNIT STUDY EVALUATIONS

Unit	Parameter	
Aqua Cleer Model H5* (Unit 1)	Average salt rejection ^{††}	- 91%
	Average water temperature	- 20°C
	Average water pressure	- 40 psig
	Daily production rate	- 3.5 gal.
	Average percent conversion [†]	- 28
Aqua Cleer Model H5* (Unit 2)	Average salt rejection ^{††}	- 86%
	Average water temperature	- 20°C
	Average water pressure	- 40 psig
	Daily production rate	- 5 gal.
	Average percent conversion [†]	- 29
Water Purification Systems, Inc. Model WPSI-UTC-5 (Unit 1)	Average salt rejection ^{††}	- 54%
	Average water temperature	- 20°C
	Average water pressure	- 40 psig
	Daily production rate	- 1.6 gal.
	Average percent conversion [†]	- 7
Model WPSI-UTC-5 (Unit 2)	Average salt rejection ^{††}	- 88%
	Average water temperature	- 20°C
	Average water pressure	- 40 psig
	Daily production rate	- 1.6 gal.
	Average percent conversion [†]	- 7
Ozomatic Water Purifier (Units 1 and 2)	Average salt rejection	- N.A.
	Average water temperature	- 16°C
	Average water pressure	- N.A.
	Daily production rate (1.5 gallons/batch)	- 3 gal.
Ultraviolet Water Conditioning System Model CW-5 (Units 1 and 2)	Average salt rejection	- N.A.
	Average water temperature	- 16°C
	Average water pressure	- 40 psig
	Daily production rate (0.7 gpm)	- 64 gal.

N.A. - not applicable

* - modified for THM removal

+ - percent conversion = product flow rate/feed flow rate x 100

** - quantity water produced in 8 hours

†† - $1 - \frac{\text{product water conductivity}}{\text{feed water conductivity}}$